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# Summary of the 1997 U.S. North and South Pacific Albacore Troll Fisheries

By

John Childers and Forrest R. Miller

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# SUMMARY OF THE 1997 U.S. NORTH AND SOUTH PACIFIC ALBACORE TROLL FISHERIES[1]

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## INTRODUCTION

North Pacific albacore (*Thunnus alalunga*) are taken by fisheries from various nations (Table 1). Japan is the largest harvester, annually taking 74% of the North Pacific albacore landed by all nations, while the U.S. annually takes less than 20%. U.S. troll vessels have fished for albacore in the North Pacific since the early 1900's (Clemens and Craig, 1965). The collection of logbook and length-frequency data from the U.S. North Pacific albacore troll fishery began in 1951. The agencies involved in the voluntary collection of logbook, length-frequency, and landings information from the U.S. albacore troll fisheries are the Southwest Fisheries Science Center (SWFSC) of the National Marine Fisheries Service (NMFS), Western Fishboat Owners Association (WFOA), Pacific States Marine Fisheries Commission (PSMFC), and the state fisheries agencies of California, Oregon, and Washington. Larger troll vessels with increased carrying capacity and range have joined the U.S. North Pacific fleet during the past forty years, and are fishing areas offshore and west of the International Dateline. In recent years the North Pacific season has begun as early as mid-April in areas northwest of Midway Island. In July and August, the fleet fishes near 45°N, 150°W and along the West Coast from Vancouver Island to California. Fishing can continue into November if weather permits and sufficient amounts of albacore remain available to troll gear.

Japan takes the largest proportion of albacore harvested annually in the South Pacific (average of 41%). The U.S. annually takes 2% of the total landings of South Pacific Albacore. Exploratory troll fishing for albacore in areas east of New Zealand in 1986 resulted in the development of the U.S. South Pacific troll fishery (Laurs et al., 1987). The collection of logbook, landings, and length-frequency data from the U.S. South Pacific fishery began in 1987, just after that fishery's inception. This fishery takes place during the austral summer months (December through April). U.S. troll vessels that participate in the South Pacific fishery depart from the U.S. West Coast or Hawaii after the end of the North Pacific season and travel to American Samoa or French Polynesia to prepare for the South Pacific season. South Pacific fishing areas extend from the east coast of New Zealand to approximately 110°W between 25°S and 45°S. At the end of the season (in March or April), most vessels unload in Pago Pago,

American Samoa then travel to Hawaii or the U.S. West Coast to prepare for the next North Pacific fishing season.

This report presents summaries of the logbook (catch/effort), landings and length-frequency information collected from the 1997 North Pacific and the 1996-97 South Pacific albacore seasons. Data from the 1996 North Pacific season, 1995-96 South Pacific season, and from non-U.S. albacore fisheries (where available) are included for comparison.

## DATA COLLECTED

Total annual landings data from the various fisheries that catch albacore in the Pacific Ocean are available from 1952 to 1997 (Tables 1 and 2). The SWFSC collects landings, logbook and length-frequency information from the two U.S. Pacific albacore troll fisheries and sea surface temperature (SST) information for the North Pacific fishery. Direct landings and at-sea transshipments are provided by the WFOA and collected from state landings receipts submitted by fish buyers and canneries. Daily catch and effort data are obtained from completed copies of the *U.S. Pacific Albacore Logbook*, that are voluntarily submitted by fishermen, or completed by port samplers who collect the information from cooperating fishermen. Approximately 620 logbooks were distributed to albacore fishermen for the 1997 North Pacific and the 1996-97 South Pacific albacore seasons. Length-frequency data from the 1997 North Pacific season were collected by one NMFS biologist aboard a U.S. troll vessel and by port samplers in the ports of Westport and Ilwaco, Washington, Astoria, Newport, and Coos Bay, Oregon, Crescent City, Eureka, and Terminal Island, California and Pago Pago, American Samoa.

North Pacific sea surface temperatures (SSTs) recorded from commercial transport ships, fishing vessels, and research vessels, were compiled into monthly means and computer-analyzed. Contours of SSTs were drawn with a resolution of 1° latitude-longitude. Analysis of SSTs shows the distribution of isotherms and the locations of ocean fronts (areas of north-south close spacing of isotherms). Insufficient SST information is available from the areas of the South Pacific fishery (east of New Zealand to 110°W and south of 30°S) to make an analysis possible.

## LOGBOOK SAMPLING COVERAGE

Logbook sampling coverage is the ratio of landings from sampled trips (those trips from which logbook data were received) to total landings. Landings from sampled trips in some past seasons are not available. For consistent comparison of sampling coverage between current and past seasons, sampled landings are estimated by multiplying numbers of fish caught (recorded in logbooks) by the average weight of those fish and summing these estimates from sampled logbooks.

A total of 499 trips (of approximately 2,100 total trips) were sampled for logbook information during the 1997 North Pacific season. Sampled landings total 5,403 metric tons (t), resulting in a logbook sampling coverage rate of 36%, slightly lower than 45% in 1996 (Table 3).

Logbook data from the 1996-97 South Pacific season were collected from 20 trips of the 37 trips made by U.S. troll vessels. These sampled trips landed 961 t, resulting in a logbook sampling coverage of 69% compared to 48% for the 1995-96 season (Table 4).

## LENGTH-FREQUENCY SAMPLING COVERAGE

Length-frequency sampling coverage is the ratio of the number of fish sampled (measured) to the total number of fish landed for the season. The total number of fish landed for the season is estimated by dividing total landings by the average weight of fish landed. The estimated total number of fish landed during the 1997 North Pacific season is 2,138,654 fish. A total of 40,883 albacore were measured, resulting in a length-frequency sampling coverage of 1.9%, nearly the same as 1.8% coverage in the 1996 North Pacific season (Table 3).

Length-frequency data for the 1996-97 South Pacific albacore fishery were collected by port samplers in Pago Pago. Samplers measured 1,558 albacore from troll vessel landings and transshipments, resulting in a length-frequency sampling coverage rate of 0.7%, the same coverage rate as the 1995-96 season (Table 4).

## TOTAL EFFORT AND CATCH

Fishing effort in the albacore troll fisheries is measured in number of fishing days. Total fishing effort for the U.S. albacore troll fisheries is estimated by dividing total landings (in pounds) by catch-per-unit effort (in numbers of fish per day) then dividing by average weight (in pounds). Troll vessels fished an estimated 46,492 days during the 1997 North Pacific albacore season, a 57% increase in effort from 29,698 days fished in 1996 (Table 3). This large increase in effort can be attributed to a large influx of vessels from other fisheries (e.g. salmon trollers) into the albacore troll fishery. Total landings from the 1997 North Pacific albacore season decreased to 14,872 t from 15,600 t landed in 1996. Estimated albacore landings by non-U.S. fisheries that target albacore in the North Pacific are listed in Table 1.

Total fishing effort for the 1996-97 South Pacific albacore fishery is estimated to be 2,885 days, a decrease of 37% from 4,551 days fished in the 1995-96 season (Table 4). The significant decrease in effort may be attributed to poor overall production for the last several years in the South Pacific fishery (Table 2). Total U.S. landings for 1996-97 decreased to 1,402 t from 2,186 t landed in 1995-96. Estimated landings by non-U.S. fisheries targeting albacore in the South Pacific are listed in Table 2.

## DISTRIBUTION OF CATCHES AND SSTs

Albacore catches recorded during the 1997 North Pacific season extend from the West Coast to 169°E, between approximately 30°N and 50°N. Areas of high catch indicate productive regions where albacore are available to troll gear. Based on sampled logbook data, the highest catch areas for the season were located between 149°W and 159°W from 42°N to 46°N, and between the West Coast and 127°W from Cape Blanco to the Straits of Juan de Fuca (Figure 1). Catch areas recorded by U.S. troll vessels for each month of the 1997 North Pacific season are shaded on corresponding monthly SST contour charts in Figures 2a through 2f. These figures show the relationship between fishing areas, SST fronts and isotherm patterns. Insufficient logbook data are available for the months of April and November to make an analysis possible. High catch areas in May were located north of Midway Island between 31°N and 37°N from 170°W to the International Dateline (Figure 2a). SSTs in this area ranged from 15°C to 18°C (59°F to 64.4°F) and were 1°C to 2°C below normal ("normal" refers to the long-

term mean averaged over the past 20 years). High albacore catches in June extended eastward from 170°W along the southern part of the sub-Arctic ocean front to 140°W between 34°N and 41°N where SSTs ranged from 14°C to 17°C (57.2°F to 62.6°F) and were 2°C to 3°C below normal (Figure 2b). During July, the most productive offshore fishing occurred between 37°N and 46°N from 140°W to 160°W in SSTs ranging from 14°C to 20°C (57.2°F to 68.0°F, Figure 2c), which were 1°C to 2°C below normal. During July, fishing off the West Coast from Cape Blanco to Vancouver Island was in near normal SSTs between 15°C and 16°C (59°F to 60.8°F). Here, SST edges (fronts) associated with coastal upwelling were prominent ocean features along the coasts of California and Oregon from June to October. High catches in August were located between 140°W and 162°W from 42°N to 47°N and between the West Coast and 128°W from Cape Mendocino to Vancouver Island (Figure 2d). SSTs ranged from 14°C to 16°C (57.2°F to 60.8°F) in the offshore area and from 15°C to 17°C (59°F to 62.6°F) in the coastal area. SSTs were near normal offshore and 1°C to 2°C above normal in the coastal fishing areas. High albacore catches in September were also distributed in the coastal and offshore areas (Figure 2e). The most productive albacore fishing in the coastal areas ranged from Point Conception to Vancouver Island and was in SSTs near 15°C (59°F ) to the north and 19°C (66.2°F) to the south. SSTs were 1°C to 2°C above normal along the West Coast. The offshore catch area between 148°W and 158°W from 40°N to 47°N was in near normal SSTs between 15°C and 18°C (59°F to 64.4°F). Catch data from October indicated the best catches along the coast were between Monterey Bay and Point Conception in 16°C to 19°C (60.8°F to 66.2°F) water that was about 2°C above normal (Figure 2f). Offshore catches in October were between 150°W and 156°W from 39°N to 41°N where SSTs were 17°C (62.6°F).

Albacore catches recorded during the 1995-96 South Pacific season were summarized for the season and for each month by 5° x 5° squares (Figures 3a through 3f). The highest albacore catches of the season were between 145°W and 160°W from 35°S to 45°S (Figure 3a). Most of the fish caught in December 1996 were taken between 155°W and 170°W from 30°S to 40°S (Figure 3b). The areas where most fish were caught in January 1997 are between 145°S and 160°S from 35°S to 40°S (Figure 3c). Catches in February were widely distributed with the highest catches (greater than 4,700 fish per 5° square) between 145°W and 160°W from 35°S to 45°S (Figure 3d). Only one 5° square (between 150°W and 155°W from 40°S to 45°S) in March produced more than 4,770 fish (Figure 3e). The limited logbook data available from April indicates 360 fish were caught between 155°W and 160°W from 40°S to 45°S (Figure 3f).

## CATCH-PER-UNIT EFFORT

Catch-Per-Unit Effort (CPUE) is used as an indication of relative abundance of albacore available to troll gear, or a measure of fishing success, and is expressed in numbers of fish caught per day of fishing. Catch (in numbers of fish) and effort (in days fished) were summarized by 10-day, 1°-square strata in which there was at least one day of fishing effort (Kleiber and Perrin, 1991). Average CPUE is calculated as follows:

$$\text{Average CPUE} = \frac{1}{n}\sum^{n}\frac{\sum C_i}{\sum E_i}$$

Where $C_i$ is the total sampled catch in the $i^{th}$ strata, $E_i$ is the total sampled effort in the $i^{th}$ strata, and n is the total number of strata.

CPUE for the North Pacific albacore troll fishery declined by approximately 50% between 1963 and 1990, but has been increasing since 1990 (Figure 4). This increasing trend is strongly influenced by the success of the offshore fishery since the late 1980's. The average CPUE for the 1997 North Pacific season decreased to 46 fish per day from 91 fish per day in the 1996 season (Table 3). This dramatic drop in CPUE was most likely due to the increased effort from new vessels entering the albacore troll fishery from other West Coast fisheries.

CPUE for the U.S. South Pacific troll fishery declined between the 1986-87 and 1992-93 seasons (Figure 5). CPUE then peaked at 150 fish per day in 1994-95. The CPUE for the 1996-97 South Pacific season was 79 fish per day, nearly the same as 71 fish per day in the 1995-96 season1 (Table 4).

CPUEs from the 1997 North Pacific season were summarized (averaged) for the season and each month by 1° x 1° squares (Figures 6a to 6g). Insufficient logbook data were collected for April and November to make an analysis of CPUE distribution for those months possible. The highest CPUEs averaged for the season ranged from 100 to 300 fish per day and were distributed between 150°W and 162°W from 40°N to 47°N (Figure 6a). In May, CPUEs greater than 300 fish per day were distributed between 176°W and 178°E from 35°N to 37°N (Figure 6b). In June, CPUEs from 100 to 317 fish per day were distributed between 142°W and 153°W from 35°N to 42°N (Figure 6c). The highest CPUEs (between 100 and 300 fish per day) in July were distributed between 149°W and 155°W from 41°N to 47°N (Figure 6d). The highest CPUEs in August were located between 152°W and 162°W from 42°N to 47°N (Figure 6e). CPUEs in September were highest between 151°W and 158°W from 40°N to 47°N (Figure 6f). High CPUEs were also scattered off Point Conception in September. Only four 1° squares had CPUEs that exceeded 100 fish per day in October (Figure 6g). They were located between 143°W and 155°W from 40°N to 41°N. Monthly averaged CPUEs were highest in May and lowest in July and October (Figure 7).

CPUEs for the 1996-97 South Pacific season were summarized (averaged) for the season and each month by 5° x 5° squares (Figures 8a through 8f). The highest CPUEs for the 1996-97 season ranged from 100 to 300 fish per day between 155°W and 170°W from 30°S to 40°S (Figure 8a). CPUEs in December 1996 ranged from 100 to 300 fish per day between 155°W and 170°W from 30°S to 40°S (Figure 8b). In January, 1997 the highest CPUEs were scattered between 135°W and 170°W from 35°S to 40°S (Figure 8c). February's highest CPUEs were located between 150°W and 160°W from 40°S to 45°S (Figure 8d). CPUEs between 100 and 300 fish per day in March were located between 145°W and 155°W from 40°S to 45°S (Figure 8e). In April, CPUEs ranging from 1 to 100 fish/day were distributed from 145°W to 160°W from 35°S to 45°S (Figure 8f). Monthly-averaged CPUEs for the 1996-97 South Pacific troll season were highest in December 1996 and decreased as the season progressed (Figure 9).

[1] CPUE values for past seasons may differ from previously published values due to updates in catch/effort data.

## LENGTH-FREQUENCIES

Fork lengths (FL) of albacore measured during the 1997 North Pacific season range from 35 cm (2 lb or 0.9 kg) to 115 cm (68 lb or 31.0 kg) and average 70 cm (15 lb or 7.0 kg). The average FL of sampled albacore from the 1996 season is 66 cm (13 lb or 5.9 kg). Three length-frequency modes are evident in the histogram of samples from the 1997 North Pacific season (Figure 10). The most prominent mode is centered near 73 and 74 cm FL (4 years old). Two less prominent modes are centered at 64 cm (3 years old) and 57 cm (2 years old).

Small albacore (less than 60 cm FL) may not be adequately represented in the length-frequency data collected from the 1997 North Pacific fishery. The larger troll vessels that fish further offshore and sell most of their catch to canneries or buying stations (which may pay less for small fish), may release small fish when they are abundant in the catches. The smaller, coastal trollers may sell fish direct to the public or other markets where small fish are preferred. Coastal trollers also spend more time in port during the season so they may retain more small fish than larger offshore vessels.

Albacore FLs measured during the 1996-97 South Pacific season range from 43 cm (4 lb or 1.6 kg) to 100 cm (45 lb or 20.4 kg) and average 67 cm (14 lb or 6.2 kg). The average FL of sampled albacore from the 1995-96 season is 69 cm (15 lb or 6.7 kg). Several length-frequency modes are apparent in the histogram of samples from the 1996-97 season (Figure 10). The most prominent mode is centered at 69 cm (4 years old) FL while the two less prominent modes are centered at 61 cm (3 years old) and 76 cm FL (5 years old).

Length-weight-age conversions for North Pacific albacore and length-weight conversions for South Pacific albacore were taken from "A review of the biology and fisheries for North Pacific albacore (*Thunnus alalunga*)" by Bartoo and Foreman, 1993. Length-age conversions for South Pacific albacore are taken from Labelle, et al., 1993.

## SUMMARY

Logbook sampling coverage for the 1997 North Pacific albacore fishery declined to 36% from 45% in 1996. Length-frequency sampling coverage remained nearly the same at 1.9% in 1997. Total effort by U.S. troll vessels in 1997 increased 57% to 46,492 days. U.S. troll vessels landed a total of 14,872 t during the 1997 North Pacific season. The season began in April north of Midway Island and ended in November off the U.S. West Coast. Albacore catch locations ranged from the West Coast to 169°E. The highest reported catches during the season were centered near 44°N, 152°W, and near 45°N, 125°W. The most productive fishing areas followed the sub-arctic ocean front delineated by 15°C and 18°C isotherms (59.0°F and 64.4°F, respectively) in the offshore areas and were found near fronts caused by upwelling in coastal areas. The average CPUE for the 1997 season decreased from 91 fish per day in 1996 to 46 fish per day. The large decrease in CPUE and increase in effort is due to the increased number of vessels from other fisheries that are beginning to target albacore. Season-averaged CPUEs between 100 and 300 fish per day were distributed between 150°W and 162°W from 40°N to 47°N. A total of 40,883 albacore were measured during the 1997 North Pacific season. FLs of sampled albacore range from 35 cm (2 lb or 0.9 kg) to 115 cm (68 lb or 31.0 kg) and averaged 70 cm (15 lb or 7.0 kg). The histogram of length-frequency samples from the 1997 season displays

three modes centered at 73 cm, 64 cm and 57 cm FL. Fish less than 60 cm FL may not be adequately represented in the North Pacific length-frequency samples due to releasing of small fish.

Logbook sampling coverage for the South Pacific albacore troll fishery increased from 48% in the 1995-96 season to 69% in the 1996-97 season. Length-frequency sampling coverage remained the same at 0.7%. Total effort by U.S. troll vessels in the South Pacific decreased 37% to 2,885 days in the 1996-97 season. U.S. troll vessels landed 1,402 t of albacore during the 1996-97 South Pacific season. The 1996-97 season began in December 1996 and ended in April 1997. The most productive areas were between 145°W and 160°W, from 35°S to 45°S. The average CPUE for the 1996-97 season is 79 fish per day, compared to 71 fish per day in the 1995-96 season. CPUEs ranging from 100 to 300 fish per day were distributed between 155°W and 170°W, from 30°S to 40°S. A total of 1,558 albacore were measured during the season. Fork lengths of measured fish range from 43 cm (4 lb or 1.6 kg) to 100 cm (45 lb or 20.4 kg) and averaged 67 cm (14 lb or 6.2 kg). Three modes are centered at 61 cm, 69 cm and 76 cm in the length-frequency histogram of sampled fish.

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**Table 1.** North Pacific albacore landings (in metric tons) by fisheries, 1952-1997.[1]
Provisional estimates in (). -- indicates data not available. (0) indicates less than 1 metric ton.

| YEAR | JAPAN[2] | | | | | TAIWAN | | KOREA[3] | |
|---|---|---|---|---|---|---|---|---|---|
| | GILL NET | LONG LINE | POLE & LINE | PURSE SEINE | OTHER GEAR | GILL NET | LONG LINE | GILL NET | LONG LINE |
| 1952 | | 26,687 | 41,786 | 154 | 237 | | | | |
| 1953 | | 27,777 | 32,921 | 38 | 132 | | | | |
| 1954 | | 20,958 | 28,069 | 23 | 38 | | | | |
| 1955 | | 16,277 | 24,236 | 8 | 136 | | | | |
| 1956 | | 14,341 | 42,810 | | 57 | | | | |
| 1957 | | 21,053 | 49,500 | 83 | 151 | | | | |
| 1958 | | 18,432 | 22,175 | 8 | 124 | | | | |
| 1959 | | 15,802 | 14,252 | | 67 | | | | |
| 1960 | | 17,369 | 25,156 | | 76 | | | | |
| 1961 | | 17,437 | 18,636 | 7 | 268 | | | | |
| 1962 | | 15,764 | 8,729 | 53 | 191 | | | | |
| 1963 | | 13,464 | 26,420 | 59 | 218 | | | | |
| 1964 | | 15,458 | 23,858 | 128 | 319 | | 26 | | |
| 1965 | | 13,701 | 41,491 | 11 | 121 | | 261 | | |
| 1966 | | 25,050 | 22,830 | 111 | 585 | | 271 | | |
| 1967 | | 28,869 | 30,481 | 89 | 520 | | 635 | | |
| 1968 | | 23,961 | 16,597 | 267 | 1,109 | | 698 | | |
| 1969 | | 18,006 | 32,107 | 521 | 1,480 | | 634 | | |
| 1970 | | 15,372 | 24,376 | 317 | 794 | | 1,516 | | |
| 1971 | | 11,035 | 53,198 | 902 | 367 | | 1,759 | | |
| 1972 | 1 | 12,649 | 60,762 | 277 | 646 | | 3,091 | | |
| 1973 | 39 | 16,059 | 69,811 | 1,353 | 533 | | 128 | | |
| 1974 | 224 | 13,053 | 73,576 | 161 | 959 | | 570 | | |
| 1975 | 166 | 10,060 | 52,157 | 159 | 254 | | 1,494 | | 2,463 |
| 1976 | 1,070 | 15,896 | 85,336 | 1,109 | 285 | | 1,251 | | 859 |
| 1977 | 688 | 15,737 | 31,934 | 669 | 379 | | 873 | | 792 |
| 1978 | 4,029 | 13,061 | 59,877 | 1,115 | 2,097 | | 284 | | 228 |
| 1979 | 2,856 | 14,249 | 44,662 | 125 | 1,158 | | 187 | 0 | 259 |
| 1980 | 2,986 | 14,743 | 46,743 | 329 | 1,209 | -- | 318 | (6) | 597 |
| 1981 | 10,348 | 18,020 | 27,426 | 252 | 904 | -- | 339 | (16) | 459 |
| 1982 | 12,511 | 16,762 | 29,615 | 561 | 732 | -- | 559 | (113) | 387 |
| 1983 | 6,852 | 15,103 | 21,098 | 350 | 125 | -- | 520 | (233) | 454 |
| 1984 | 8,988 | 15,111 | 26,015 | 3,380 | 518 | -- | 471 | (516) | 136 |
| 1985 | 11,204 | 14,320 | 20,714 | 1,533 | 407 | -- | 109 | (576) | 291 |
| 1986 | 7,813 | 12,945 | 16,096 | 1,542 | 650 | -- | -- | (726) | 241 |
| 1987 | 6,698 | 14,642 | 19,091 | 1,205 | 189 | 2,514 | -- | (817) | 182 |
| 1988 | 9,074 | 13,904 | 6,216 | 1,208 | 177 | 7,389 | 38 | (1,016) | 109 |
| 1989 | 7,437 | 13,194 | 8,629 | 2,521 | 466 | 8,350 | 544 | 1,023 | 81 |
| 1990 | 6,064 | 15,928 | 8,532 | 1,995 | 253 | 16,701 | 287 | (1,016) | 20 |
| 1991 | 3,401 | 10,379 | 7,103 | 2,652 | 399 | 3,398 | 353 | (852) | 3 |
| 1992 | 2,721 | 19,149 | 13,888 | 4,104 | 1,534 | 7,866 | 300 | (271) | 43 |
| 1993 | 287 | 29,616 | 12,809 | 2,889 | 867 | 0 | 1,494 | 0 | 43 |
| 1994 | 263 | 29,612 | 26,391 | 2,026 | 799 | 0 | 1,586 | 0 | 43 |
| 1995 | 282 | 28,677 | 20,981 | 1,177 | 937 | 0 | 3,789 | 0 | 43 |
| 1996 | (282) | (28,677) | (23,383) | (240) | (937) | (0) | (4,596) | (0) | (43) |
| 1997 | (282) | (28,677) | (23,383) | (240) | (937) | (0) | (4,596) | (0) | (43) |

[1] Data are from the 15th North Pacific Albacore Workshop, December 3-5 1997, Nanaimo, B.C., Canada except as noted.

[2] Japanese pole & line landings include fish caught by research vessels. Longline landings for 1952-1960 exclude minor amounts taken by vessels under 20 metric tons.

[3] Korean longline landings calculated from Y. Gong (pers. comm.) using the ratio of landings, in numbers, from the North Pacific. Gillnet landings for 1979-1990 are calulated by multiplying the 1991 CPUE (# fish per pok) by effort (# poks) then multiplying by average weight (1991, 1992: 4.13 kg/fish).

**Table 1.** Continued

| YEAR | U.S.[4] | | | | | | | CANADA | MEXICO | GRAND TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| | BAIT BOAT | GILL NET | LONG LINE | PURSE SEINE | SPORT | TROLL | OTHER GEAR | TROLL | OTHER GEAR | |
| 1952 | | | 48 | | 1,373 | 23,843 | | 71 | | 94,199 |
| 1953 | | | 23 | | 171 | 15,740 | | 5 | | 76,807 |
| 1954 | | | 13 | | 147 | 12,246 | | | | 61,494 |
| 1955 | | | 9 | | 577 | 13,264 | | | | 54,507 |
| 1956 | | | 6 | | 482 | 18,751 | | 17 | | 76,464 |
| 1957 | | | 4 | | 304 | 21,165 | | 8 | | 92,268 |
| 1958 | | | 7 | | 48 | 14,855 | | 74 | | 55,723 |
| 1959 | | | 5 | | 0 | 20,990 | 5 | 212 | | 51,333 |
| 1960 | | | 4 | | 557 | 20,100 | 4 | 5 | | 63,271 |
| 1961 | 2,837 | | 5 | | 1,355 | 12,055 | 6 | 4 | | 52,610 |
| 1962 | 1,085 | | 7 | | 1,681 | 19,752 | 8 | 1 | | 47,271 |
| 1963 | 2,432 | | 7 | | 1,161 | 25,140 | 7 | 5 | | 68,913 |
| 1964 | 3,411 | | 4 | | 824 | 18,388 | 4 | 3 | | 62,423 |
| 1965 | 417 | | 3 | | 731 | 16,542 | 3 | 15 | | 73,296 |
| 1966 | 1,600 | | 8 | | 588 | 15,333 | 9 | 44 | | 66,429 |
| 1967 | 4,113 | | 12 | | 707 | 17,814 | 12 | 161 | | 83,413 |
| 1968 | 4,906 | | 11 | | 951 | 20,434 | 10 | 1,028 | | 69,972 |
| 1969 | 2,996 | | 14 | | 358 | 18,827 | 12 | 1,365 | | 76,320 |
| 1970 | 4,416 | | 9 | | 822 | 21,032 | 9 | 390 | | 69,053 |
| 1971 | 2,071 | | 11 | | 1,175 | 20,526 | 11 | 1,746 | | 92,801 |
| 1972 | 3,750 | | 8 | | 637 | 23,600 | 8 | 3,921 | 100 | 109,450 |
| 1973 | 2,236 | | 14 | | 84 | 15,653 | 14 | 1,400 | 0 | 107,324 |
| 1974 | 4,777 | | 9 | | 94 | 20,178 | 9 | 1,331 | 1 | 114,942 |
| 1975 | 3,243 | | 33 | | 640 | 18,932 | 43 | 111 | 1 | 89,756 |
| 1976 | 2,700 | | 23 | | 713 | 15,905 | 27 | 278 | 36 | 125,488 |
| 1977 | 1,497 | | 37 | | 537 | 9,969 | 36 | 53 | 0 | 63,201 |
| 1978 | 950 | | 54 | | 810 | 16,613 | 69 | 23 | 1 | 99,211 |
| 1979 | 303 | | | | 74 | 6,781 | 31 | 521 | 1 | 71,207 |
| 1980 | 382 | | | | 168 | 7,556 | 24 | 212 | 31 | (75,304) |
| 1981 | 748 | | 25 | 181 | 195 | 12,637 | 60 | 200 | 8 | (71,818) |
| 1982 | 425 | | 105 | 368 | 257 | 6,609 | 84 | 104 | 7 | (69,199) |
| 1983 | 607 | | 6 | 11 | 87 | 9,359 | 213 | 225 | 33 | (55,276) |
| 1984 | 1,030 | | 2 | 3,551 | 1,427 | 9,304 | 138 | 50 | 113 | (70,750) |
| 1985 | 1,498 | 2 | | 17 | 1,176 | 6,415 | 83 | 56 | 49 | (58,450) |
| 1986 | 432 | 3 | | 48 | 196 | 4,708 | 106 | 30 | 3 | (45,539) |
| 1987 | 158 | 5 | 149 | 27 | 74 | 2,766 | 136 | 104 | 7 | (48,764) |
| 1988 | 598 | 15 | 309 | 151 | 64 | 4,212 | 318 | 155 | 15 | (44,968) |
| 1989 | 54 | 4 | 250 | 23 | 160 | 1,860 | 272 | 140 | 2 | 45,010 |
| 1990 | 115 | 29 | 168 | 71 | 24 | 2,603 | 181 | 302 | 2 | (54,291) |
| 1991 | 0 | 17 | 313 | 0 | 6 | 1,845 | 384 | 139 | -- | (31,244) |
| 1992 | 0 | 0 | 332 | 8 | 2 | 4,572 | 408 | 363 | -- | (55,561) |
| 1993 | -- | 0 | 440 | 1 | 25 | 6,254 | 331 | 494 | -- | (55,550) |
| 1994 | 0 | 38 | 548 | -- | 106 | 10,978 | 712 | 836 | -- | (73,938) |
| 1995 | 0 | 40 | 880 | -- | 102 | 8,200 | 1,096 | 1,415 | -- | (67,619) |
| 1996 | 0 | 54 | 1,187 | -- | 88 | 15,600 | 545 | (502) | -- | (76,134) |
| 1997 | (0) | (66) | (1,856) | (2) | (818) | (14,872) | (675) | (871) | -- | (77,318) |

[4] U.S. troll boat landings for 1952-1960 include fish caught by bait boats. U.S. troll boat landings for 1984-1988 include gillnet landings. Landings for "Other" gear for 1979-1986 are raised from data with very low coverage.

**Table 2.** South Pacific albacore landings (in metric tons) by fisheries, 1952-1997.[1]
Provisional estimates in (). -- indicates data not available. (0) indicates less than 1 metric ton

| YEAR | JAPAN | | | TAIWAN | | KOREA | | U.S. | | NEW ZEALAND | | FRENCH POLYNESIA | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GILL NET | LONG[2] LINE | POLE & LINE | GILL NET | LONG LINE | GILL NET | LONG LINE | LONG[3] LINE | TROLL[4] | LONG LINE | TROLL | LONG LINE | TROLL |
| 1952 | | 154 | | | | | | | | | | | |
| 1953 | | 803 | | | | | | | | | | | |
| 1954 | | 9,578 | | | | | | | | | | | |
| 1955 | | 8,625 | | | | | | | | | | | |
| 1956 | | 7,281 | | | | | | | | | | | |
| 1957 | | 8,757 | | | | | | | | | | | |
| 1958 | | 18,490 | | | | | 146 | | | | | | |
| 1959 | | 17,385 | | | | | 456 | | | | | | |
| 1960 | | 21,638 | 45 | | | | 610 | | | | | | |
| 1961 | | 23,412 | | | | | 330 | | | | | | |
| 1962 | | 34,620 | | | | | 599 | | | | | | |
| 1963 | | 29,120 | 16 | | 608 | | 1,367 | | | | | | |
| 1964 | | 19,390 | | | 629 | | 2,911 | | | | | | |
| 1965 | | 17,793 | | | 1,640 | | 6,405 | | | | | | |
| 1966 | | 21,627 | | | 6,669 | | 10,817 | | | | | | |
| 1967 | | 15,104 | | | 11,497 | | 13,717 | | | | 5 | | |
| 1968 | | 6,659 | | | 12,254 | | 10,138 | | | | 14 | | |
| 1969 | | 4,894 | | | 9,503 | | 9,963 | | | | -- | | |
| 1970 | | 5,297 | | | 14,484 | | 11,599 | | | | 50 | -- | |
| 1971 | | 3,472 | | | 15,871 | | 14,482 | | | | -- | -- | |
| 1972 | | 3,027 | | | 16,674 | | 14,439 | | | | 268 | -- | |
| 1973 | | 2,550 | | | 17,741 | | 17,452 | | | | 484 | -- | |
| 1974 | | 1,868 | | | 16,857 | | 12,194 | | | | 898 | -- | |
| 1975 | | 1,333 | | | 16,056 | | 9,015 | | | | 646 | -- | |
| 1976 | | 2,054 | | | 13,206 | | 9,058 | | | | 25 | -- | |
| 1977 | | 2,328 | | | 21,429 | | 11,229 | | | | 621 | -- | |
| 1978 | | 2,845 | | | 20,702 | | 11,658 | | | | 1,686 | -- | |
| 1979 | | 2,274 | | | 14,987 | | 11,411 | | | | 814 | -- | |
| 1980 | | 2,216 | 19 | | 17,998 | | 10,449 | | | | 1,468 | -- | |
| 1981 | | 4,203 | 8 | | 14,390 | | 13,342 | | | | 2,085 | -- | |
| 1982 | | 4,899 | 1 | | 12,634 | | 10,769 | | | | 2,434 | -- | |
| 1983 | 32 | 5,723 | 2 | | 12,069 | | 7,069 | 5 | | | 744 | -- | |
| 1984 | 1,581 | 3,804 | | | 11,155 | | 5,321 | 9 | | | 2,773 | -- | |
| 1985 | 1,928 | 3,868 | | | 9,601 | | 13,544 | 11 | | | 3,253 | -- | |
| 1986 | 1,936 | 4,426 | | | 11,913 | | 15,877 | 0 | 89 | | 1,911 | -- | |
| 1987 | 919 | 4,490 | | | 15,009 | | 6,821 | 0 | 751 | | 1,227 | -- | |
| 1988 | 4,271 | 7,469 | | 1,000 | 17,120 | | 6,563 | 1 | 3,253 | | 330 | -- | |
| 1989 | 13,263 | 5,828 | | 8,520 | 10,867 | 172 | 5,151 | 0 | 3,068 | 19 | 5,161 | 100 | 90 |
| 1990 | 5,667 | 6,573 | | 1,859 | 11,619 | | 3,947 | 0 | 3,898 | 249 | 2,143 | 156 | 327 |
| 1991 | | 4,468 | | 1,394 | 16,508 | | 1,866 | 1 | 5,540 | 325 | 2,236 | 146 | 326 |
| 1992 | | 3,814 | 49 | | 20,956 | | 2,271 | 0 | 3,016 | 706 | 3,708 | 195 | 72 |
| 1993 | | 8,381 | 5 | | 17,701 | | 1,083 | 0 | 1,028 | 229 | 3,282 | 714 | 45 |
| 1994 | | 7,151 | 2 | | 19,731 | | | 1 | 530 | 473 | 5,094 | 913 | -- |
| 1995 | | 6,326 | | | 12,775 | | 8 | 25 | 2,072 | 428 | 5,760 | 772 | 184 |
| 1996 | | 3,847 | | | 15,244 | | 215 | (106) | 2,186 | 480 | 5,157 | 1,462 | 69 |
| 1997 | | (3,847) | -- | | (15,662) | | (845) | (285) | (1,402) | (480) | (5,157) | (2,587) | (24) |

[1] Data are from Eleventh Meeting of the Standing Committee on Tuna and Billfish, 30 May - 6 June 1998 except as noted. All landings are from areas within the SPAR statistical area except as noted.

[2] Japan long line include catches from Australia-Japan joint venture vessels.

[3] 1982 - 1996 United States long line landings from Pelagic Fisheries of the Western Pacific Region 1996 Annual Report (Total landings for all gears).

[4] United States troll landings may include catches from December of the previous year.

**Table 2. Continued.**

| YEAR | AUSTRALIA | | NEW CALEDONIA | TONGA | FIJI | WESTERN SAMOA | SOLOMON ISLANDS | CHILE[6] | VANUATU | OTHER[7] | GRAND TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | LONG LINE | TROLL[5] | LONG LINE | LONG LINE | LONG LINE | LONG LINE | LONG LINE | DRIFT NET | LONG LINE | LONG LINE | |
| 1952 | | | | | | | | | | | 154 |
| 1953 | | | | | | | | | | | 803 |
| 1954 | | | | | | | | | | | 9,578 |
| 1955 | | | | | | | | | | | 8,625 |
| 1956 | | | | | | | | | | | 7,281 |
| 1957 | | | | | | | | | | | 8,757 |
| 1958 | | | | | | | | | | | 18,636 |
| 1959 | | | | | | | | | | | 17,841 |
| 1960 | | | | | | | | | | | 22,293 |
| 1961 | | | | | | | | | | | 23,742 |
| 1962 | | | | | | | | | | | 35,219 |
| 1963 | | | | | | | | | | | 31,111 |
| 1964 | | | | | | | | | | | 22,930 |
| 1965 | | | | | | | | | | | 25,838 |
| 1966 | | | | | | | | | | | 39,113 |
| 1967 | | | | | | | | | | | 40,323 |
| 1968 | | | | | | | | | | | 29,065 |
| 1969 | | | | | | | | | | | 24,360 |
| 1970 | | 100 | | | | | | | | | 31,530 |
| 1971 | | 100 | | | | | | | | | 33,925 |
| 1972 | | 100 | | | | | | | | | 34,508 |
| 1973 | | 100 | | | | | 4 | | | | 38,331 |
| 1974 | | 100 | | | | | | | | | 31,917 |
| 1975 | | 100 | | | | | | | | | 27,150 |
| 1976 | | 100 | | | | | 6 | | | | 24,449 |
| 1977 | | 100 | | | | | 9 | | | | 35,716 |
| 1978 | | 100 | | | | | 9 | | | | 37,000 |
| 1979 | | 100 | | | | | 21 | | | | 29,607 |
| 1980 | | 100 | | | | | 25 | | | | 32,275 |
| 1981 | | 5 | | | | | 2 | | | | 34,035 |
| 1982 | | 6 | | 106 | | | 8 | | | | 30,857 |
| 1983 | | 7 | 12 | 143 | | | 19 | | | | 25,825 |
| 1984 | | 8 | 112 | 135 | | | 19 | | | | 24,917 |
| 1985 | 0 | 9 | 131 | 174 | | | 12 | | | | 32,531 |
| 1986 | 0 | 10 | 179 | 206 | | | | | | | 36,547 |
| 1987 | 129 | 11 | 563 | 252 | | | | | | | 30,172 |
| 1988 | 107 | 12 | 584 | 242 | | | | | | | 40,952 |
| 1989 | 93 | 13 | 566 | 195 | 3 | | | | | | 53,109 |
| 1990 | 51 | 15 | 1,053 | 152 | 68 | | | | | | 37,777 |
| 1991 | 213 | 20 | 909 | 171 | 208 | | | | | | 34,331 |
| 1992 | 192 | 70 | 692 | 199 | 243 | | | | | | 36,183 |
| 1993 | 226 | 55 | 755 | 231 | 463 | -- | | | | 1 | 34,199 |
| 1994 | 351 | 70 | 840 | 343 | 547 | 641 | | | | 33 | 36,720 |
| 1995 | 401 | 25 | 332 | 379 | 664 | 1,883 | 204 | 15 | 112 | 46 | 32,396 |
| 1996 | 408 | (25) | 414 | 494 | 794 | 2,470 | 971 | (21) | 287 | (49) | (34,699) |
| 1997 | (302) | (25) | (267) | (494) | (1,839) | (2,699) | (971) | (0) | (17) | (35) | (36,959) |

[5] Australia troll 1970 - 1980 are incidental catches from pole-and-line vessels targeting southern bluefin tuna. 1981-1985 include recreational catches.

[6] Chile gill net landings from R. Serra (pers. comm.).

[7] Other includes Cook Islands, Papua New Guinea, and China. China long line landings from SPC Tuna Fishery Yearbook 1996.

Table 3. Fishery statistics for the 1996 and 1997 U.S. North Pacific albacore troll fisheries.

| FISHING SEASON | NO. TRIPS | | METRIC TONS LANDED | | NO. FISH LANDED | | AVG FL (cm) | AVG WT (lb) | EFFORT | | CPUE (fish/day) | SAMPLING COVERAGE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TOTAL | SAMPLED | TOTAL | SAMPLED | TOTAL | MEASURED | | | NO. DAYS | NO. VESSELS | | LOGBOOK | L-F |
| 1996 | 1,200 | 424 | 15,600 | 7,000 | 2,702,510 | 49,378 | 66 | 12.7 | 29,698 | 623 | 91 | 45% | 1.8% |
| 1997 | 2,100 | 499 | 14,872 | 5,403 | 2,138,654 | 40,883 | 70 | 15.3 | 46,492 | 1,080 | 46 | 36% | 1.9% |



Table 4. Fishery statistics for the 1995-96 and 1996-97 U.S. South Pacific albacore troll fisheries.

| FISHING SEASON | NO. TRIPS | | METRIC TONS LANDED | | NO. FISH LANDED | | AVG FL (cm) | AVG WT (lb) | EFFORT | | CPUE (fish/day) | SAMPLING COVERAGE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TOTAL | SAMPLED | TOTAL | SAMPLED | TOTAL | MEASURED | | | NO. DAYS | NO. VESSELS | | LOGBOOK | L-F |
| 1995-96 | 44 | 29 | 2,186 | 1,049 | 324,671 | 2,226 | 69 | 14.8 | 4,551 | 62 | 71 | 48% | 0.7% |
| 1996-97 | 37 | 20 | 1,402 | 961 | 227,372 | 1,558 | 67 | 13.6 | 2,885 | 28 | 79 | 69% | 0.7% |

Logbook sampling coverage includes some non-U.S. vessels (Tonga, Canada, and Cook Islands) and vessels of unknown registry.

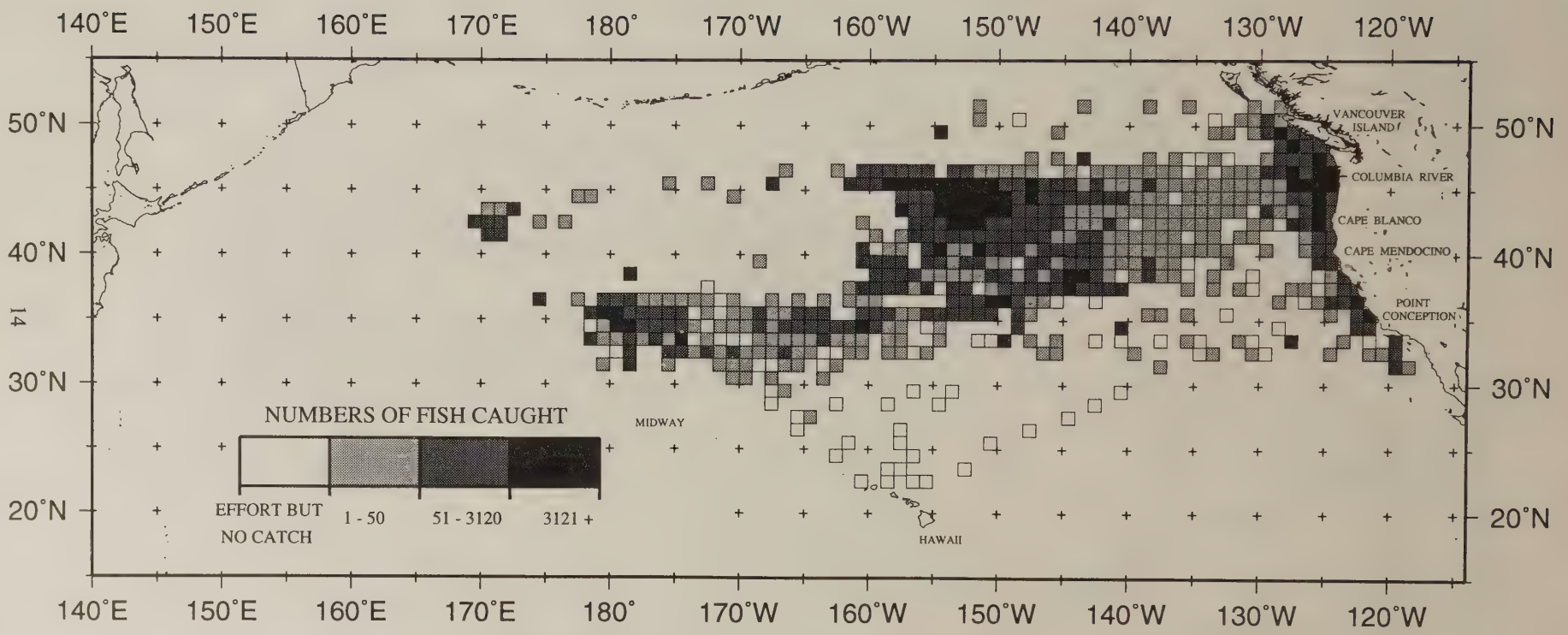


Figure 1. Albacore catches by U.S. troll vessels during the 1997 North Pacific season.

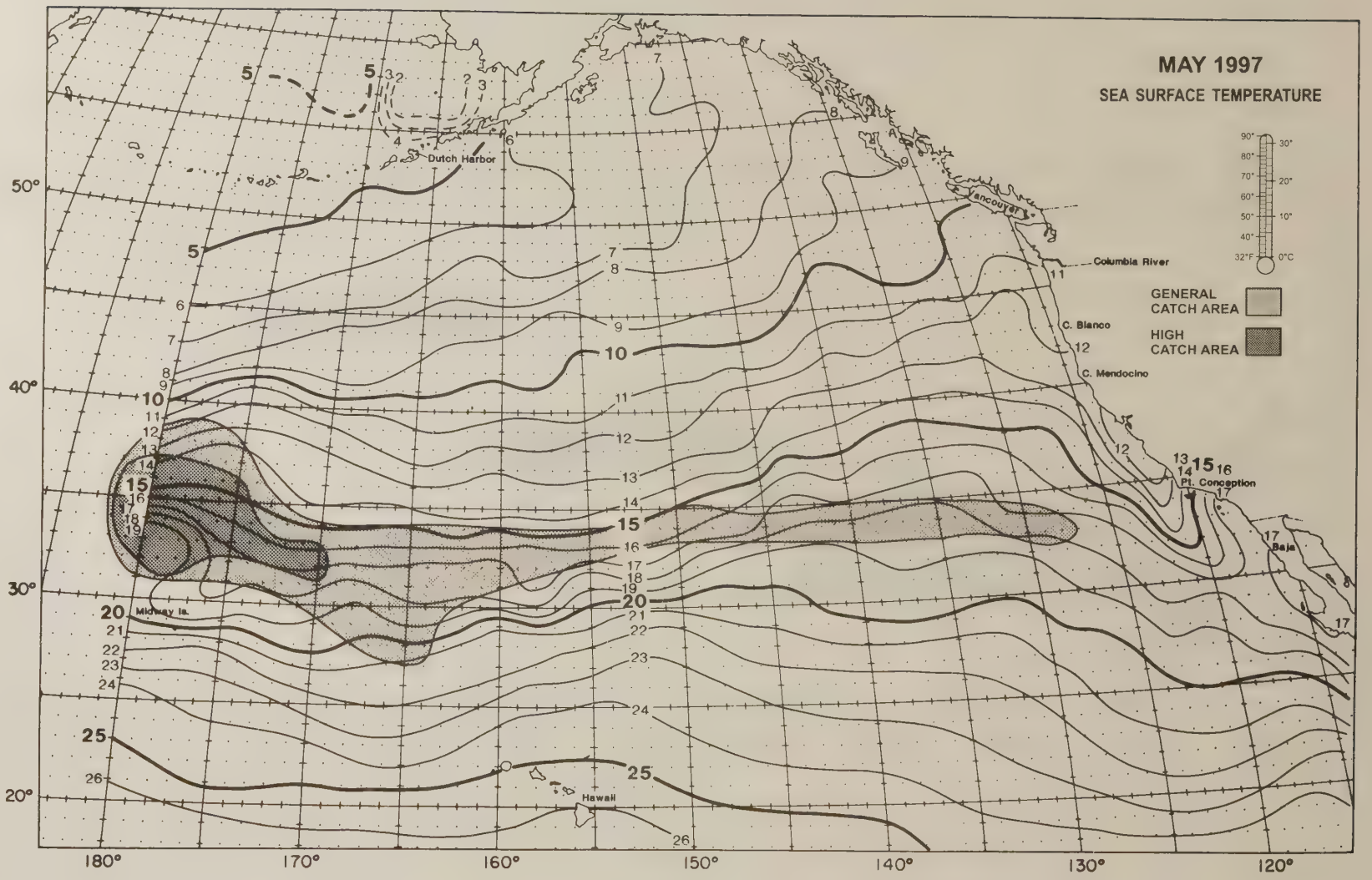


Figure 2a. Distribution of albacore catches and Sea Surface Temperatures in May 1997.

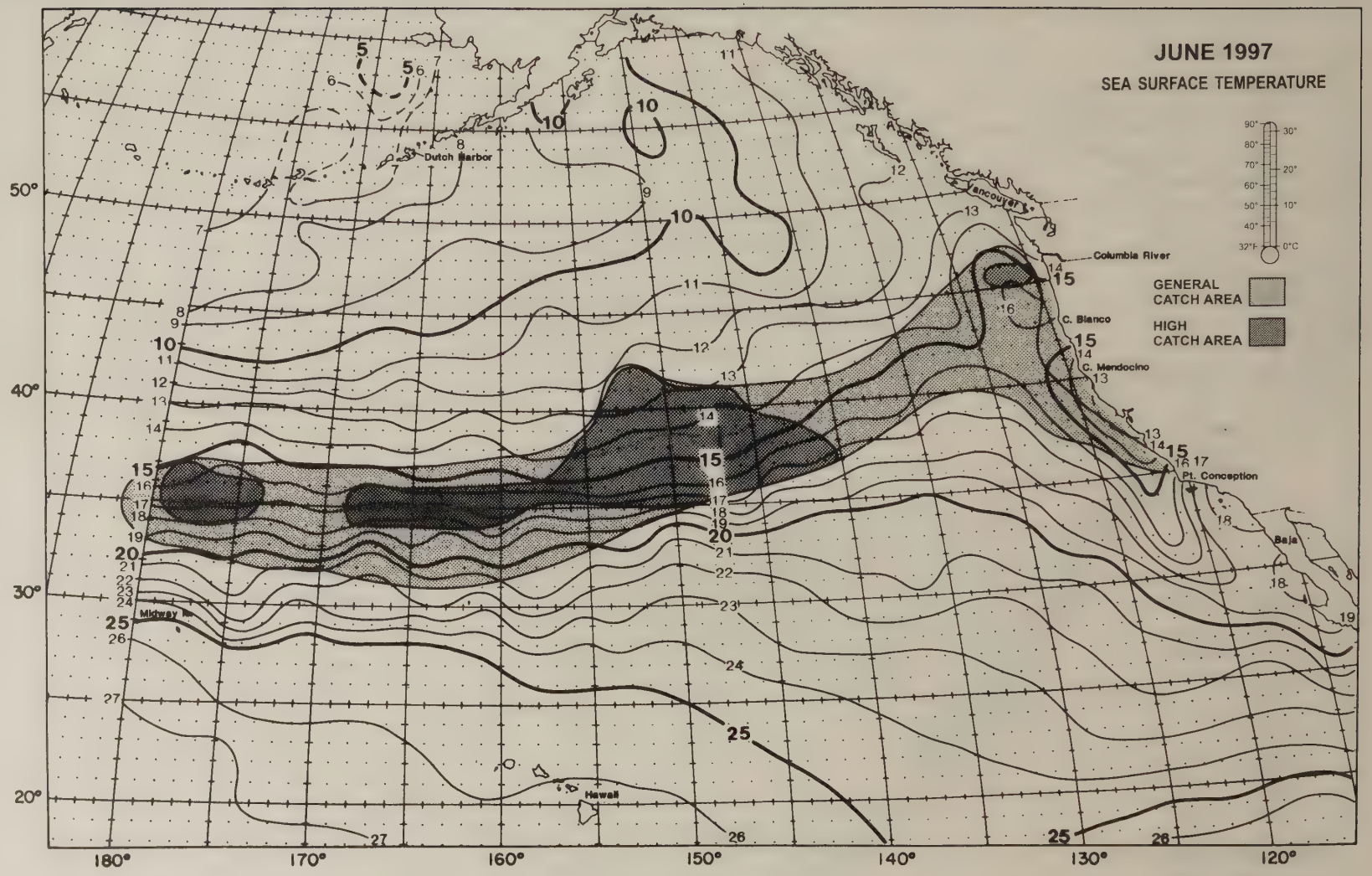


Figure 2b. Distribution of albacore catches and Sea Surface Temperatures in June 1997.

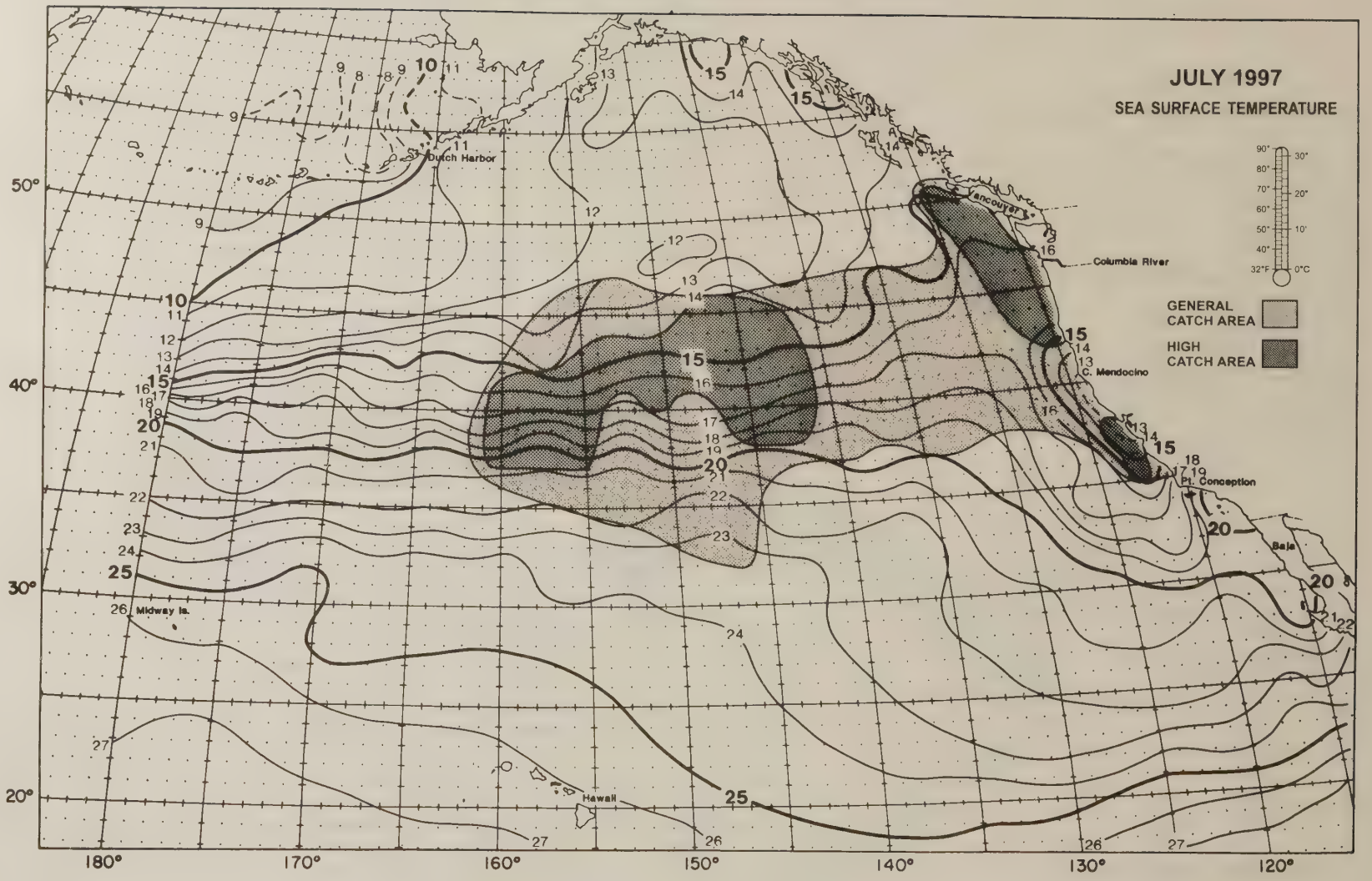


Figure 2c. Distribution of albacore catches and Sea Surface Temperatures in July 1997.

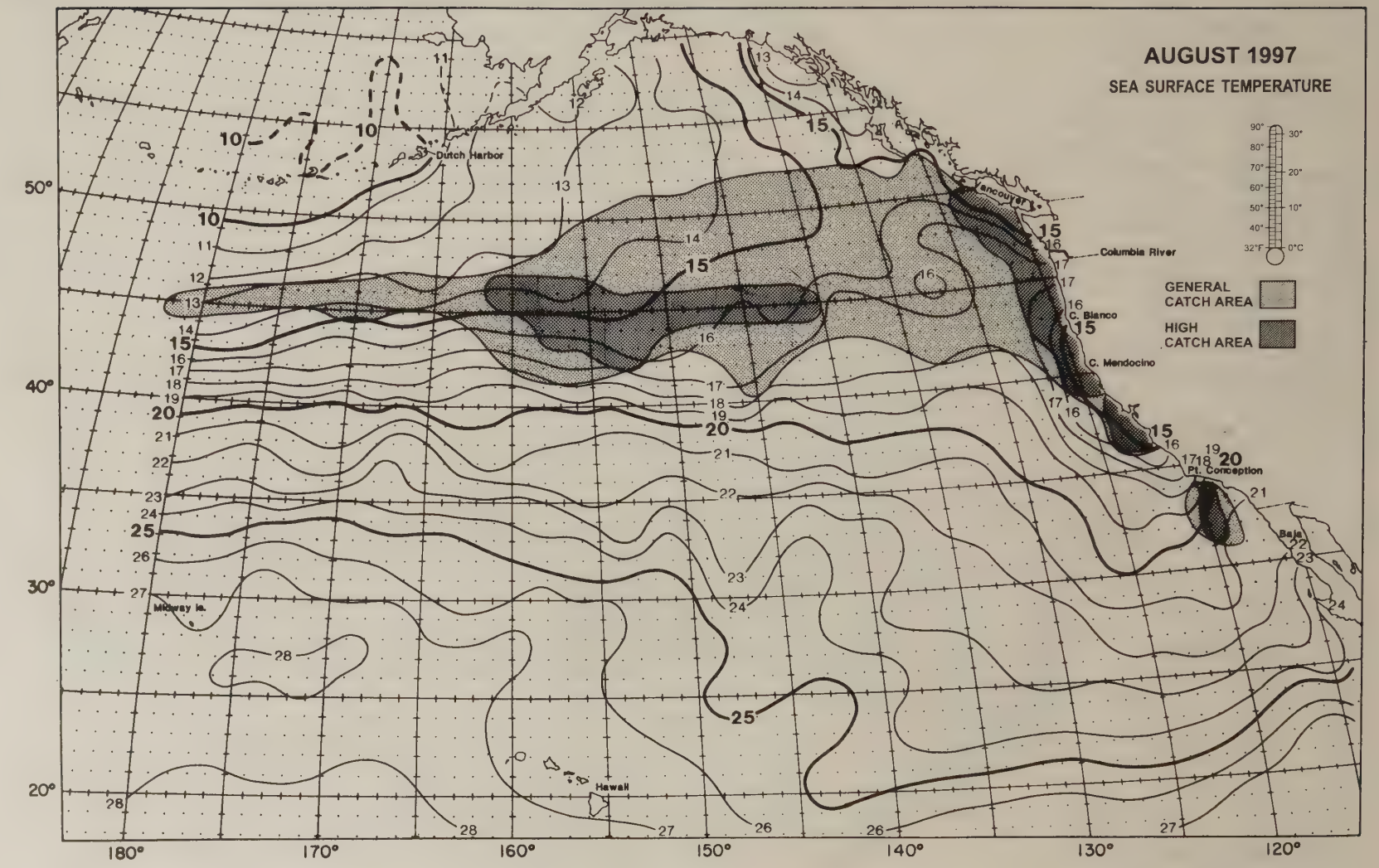


Figure 2d. Distribution of albacore catches and Sea Surface Temperatures in August 1997.

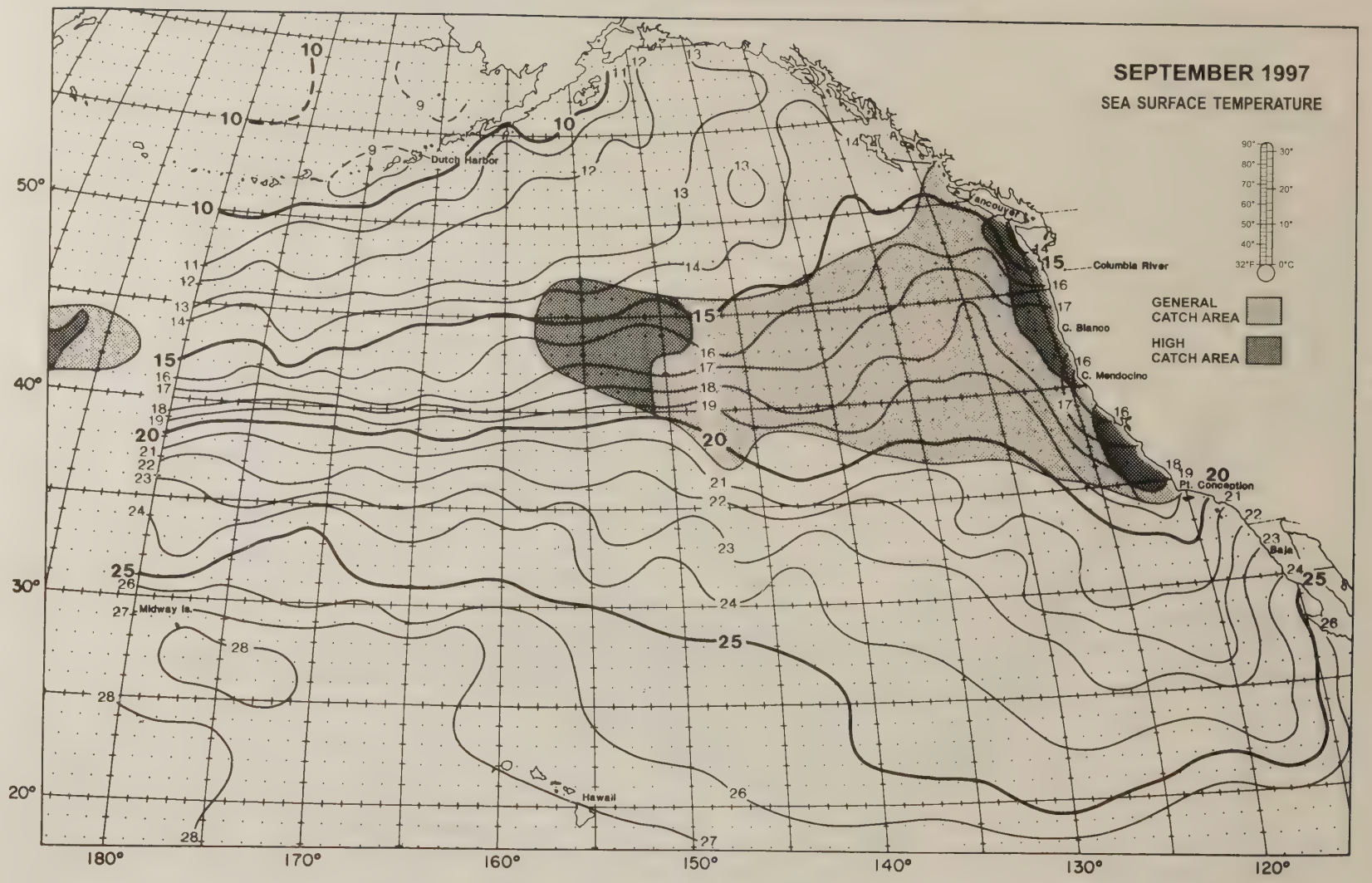


Figure 2e. Distribution of albacore catches and Sea Surface Temperatures in September 1997.

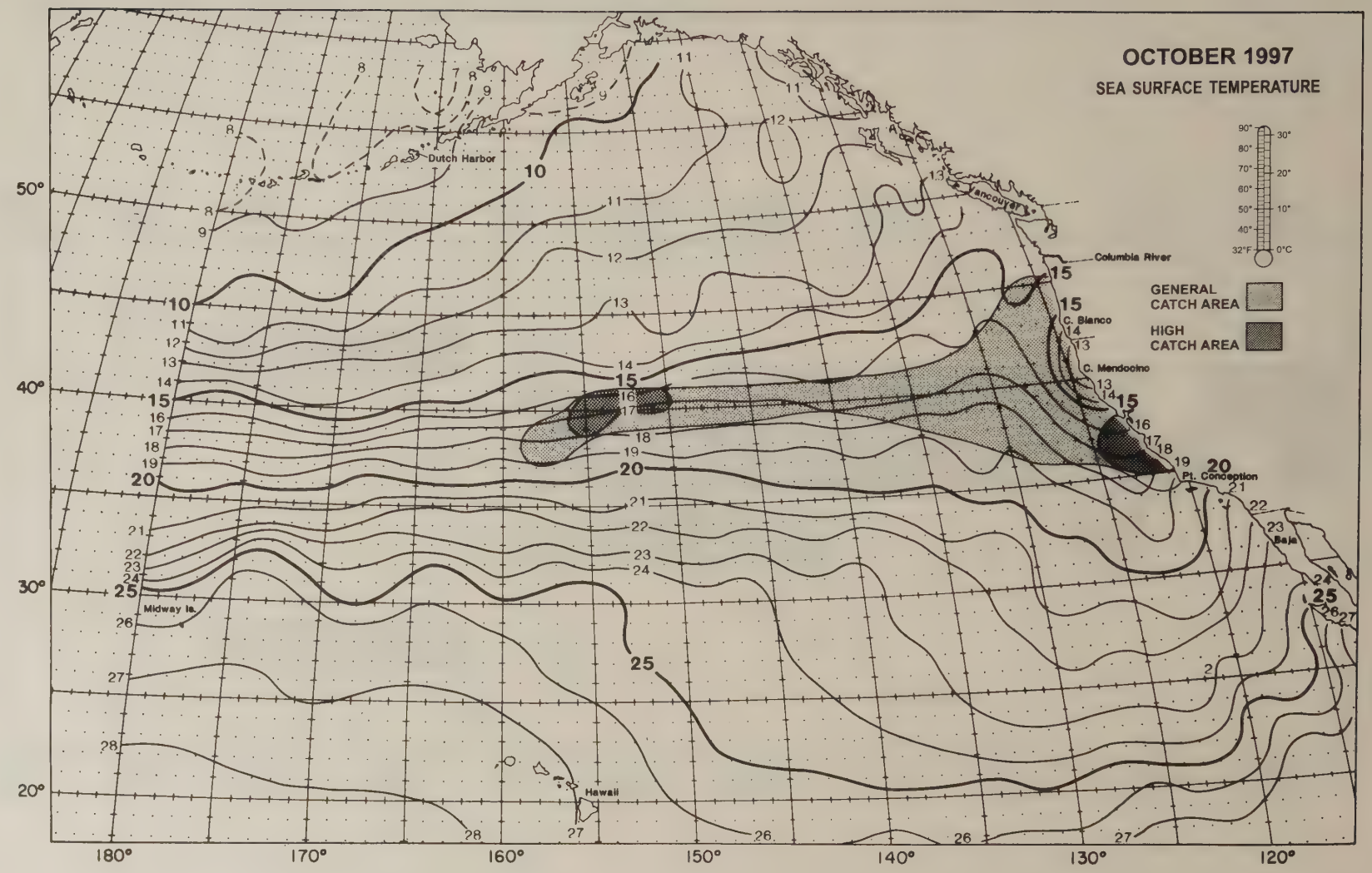


Figure 2f. Distribution of albacore catches and Sea Surface Temperatures in October 1997.

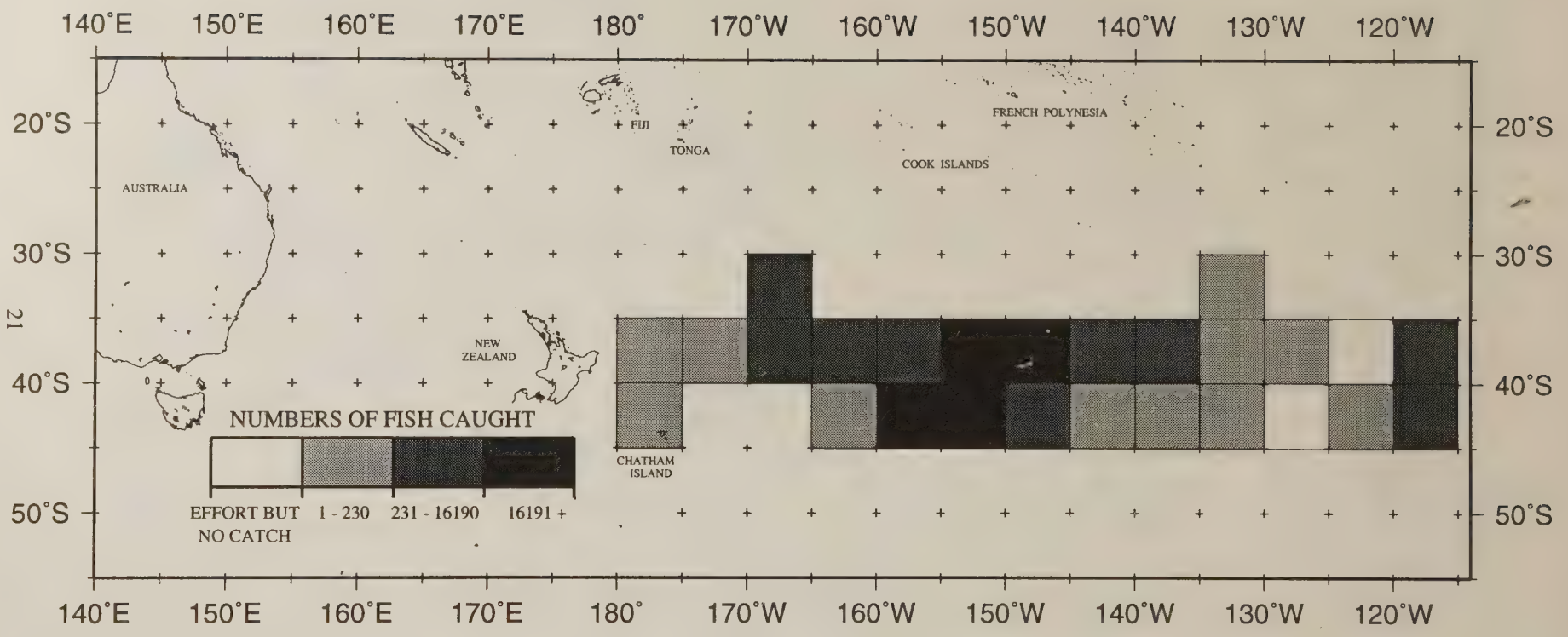


Figure 3a. Albacore catches by U.S. troll vessels during the 1996-97 South Pacific season.

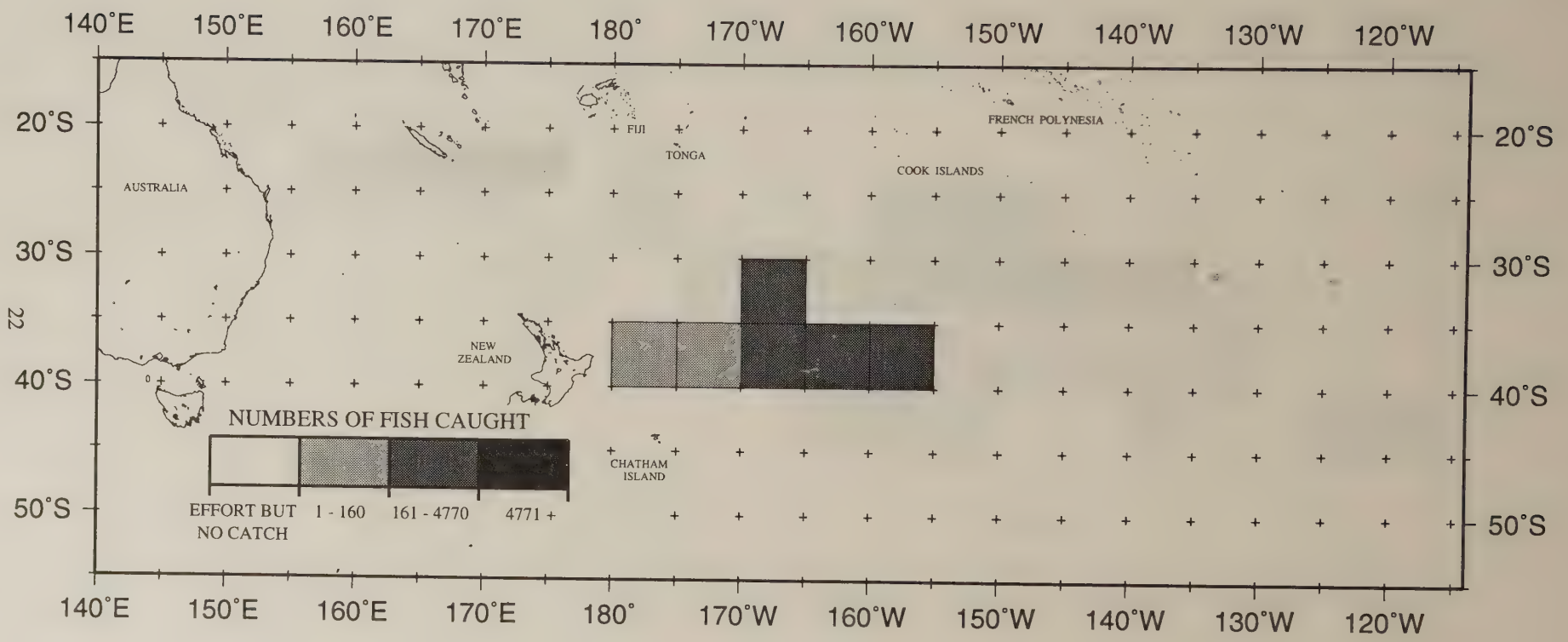


Figure 3b. Albacore catches by U.S. troll vessels during December 1996.

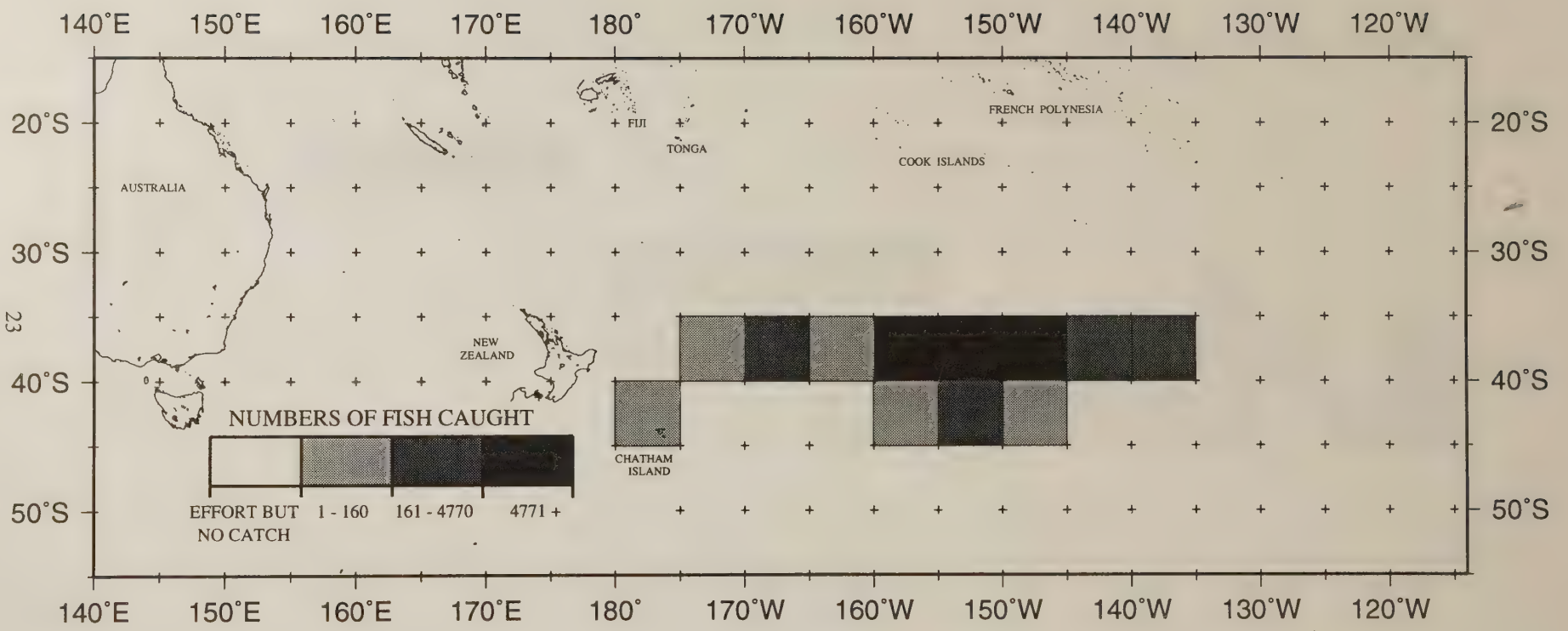


Figure 3c. Albacore catches by U.S. troll vessels during January 1997.

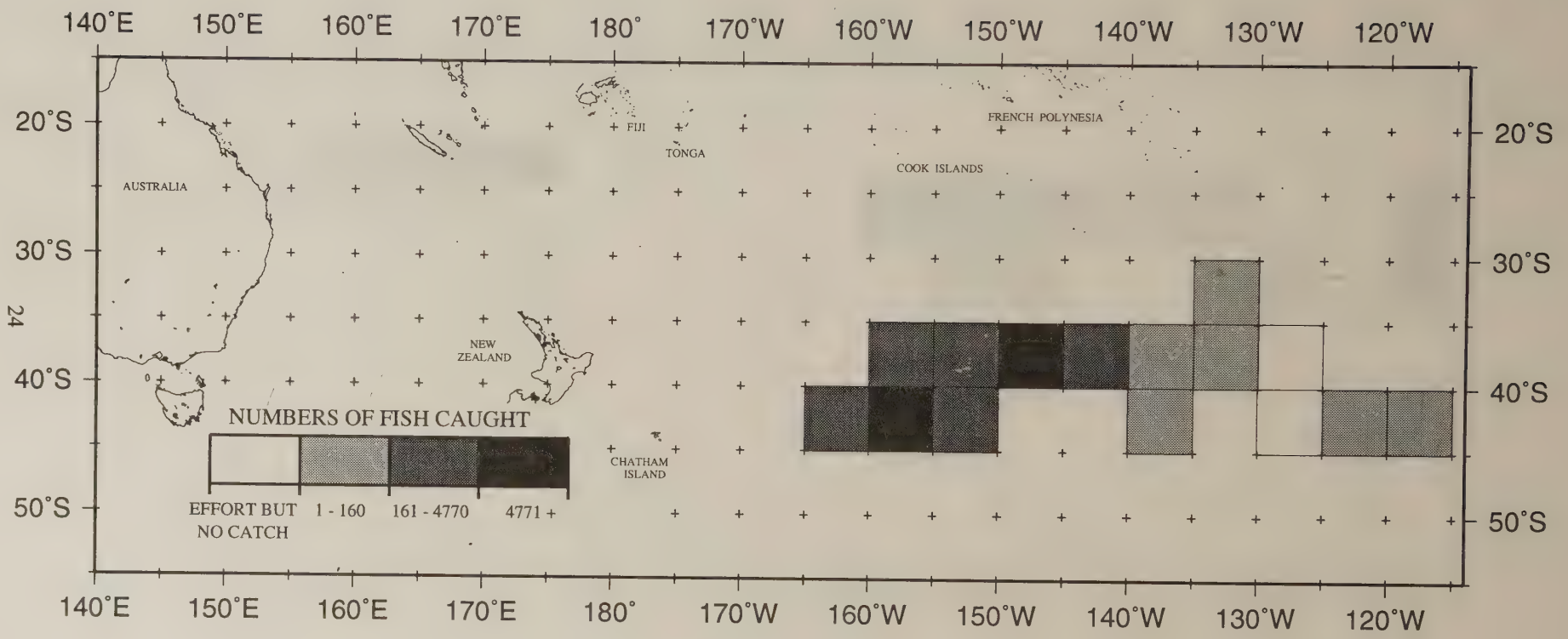


Figure 3d. Albacore catches by U.S. troll vessels during February 1997.

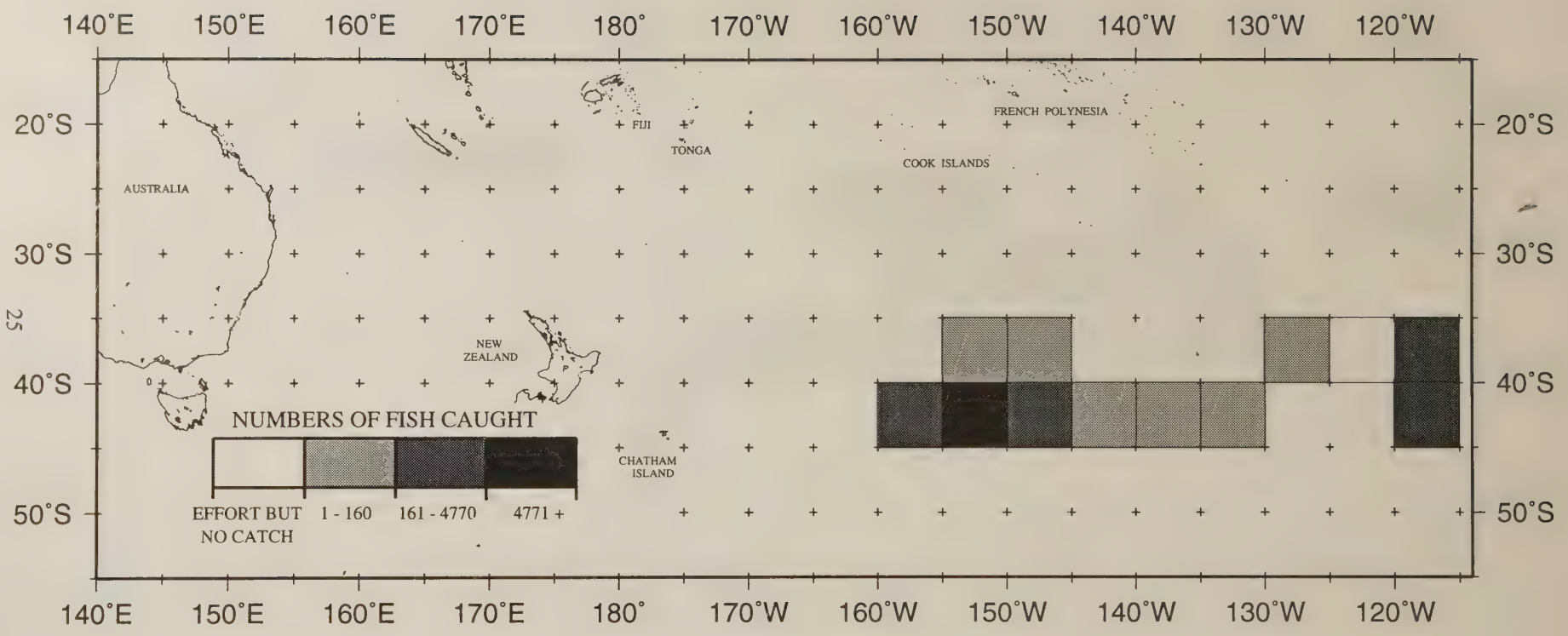


Figure 3e. Albacore catches by U.S. troll vessels during March 1997.

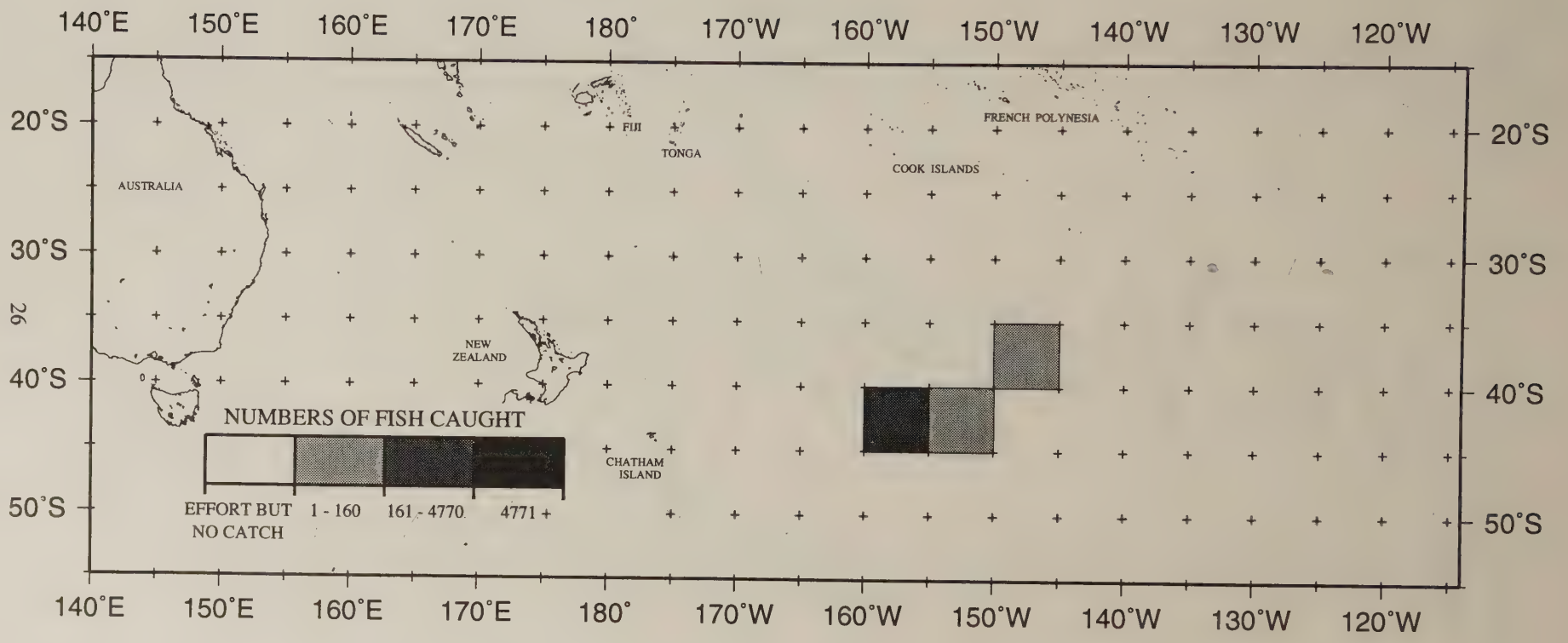


Figure 3f. Albacore catches by U.S. troll vessels during April 1997.

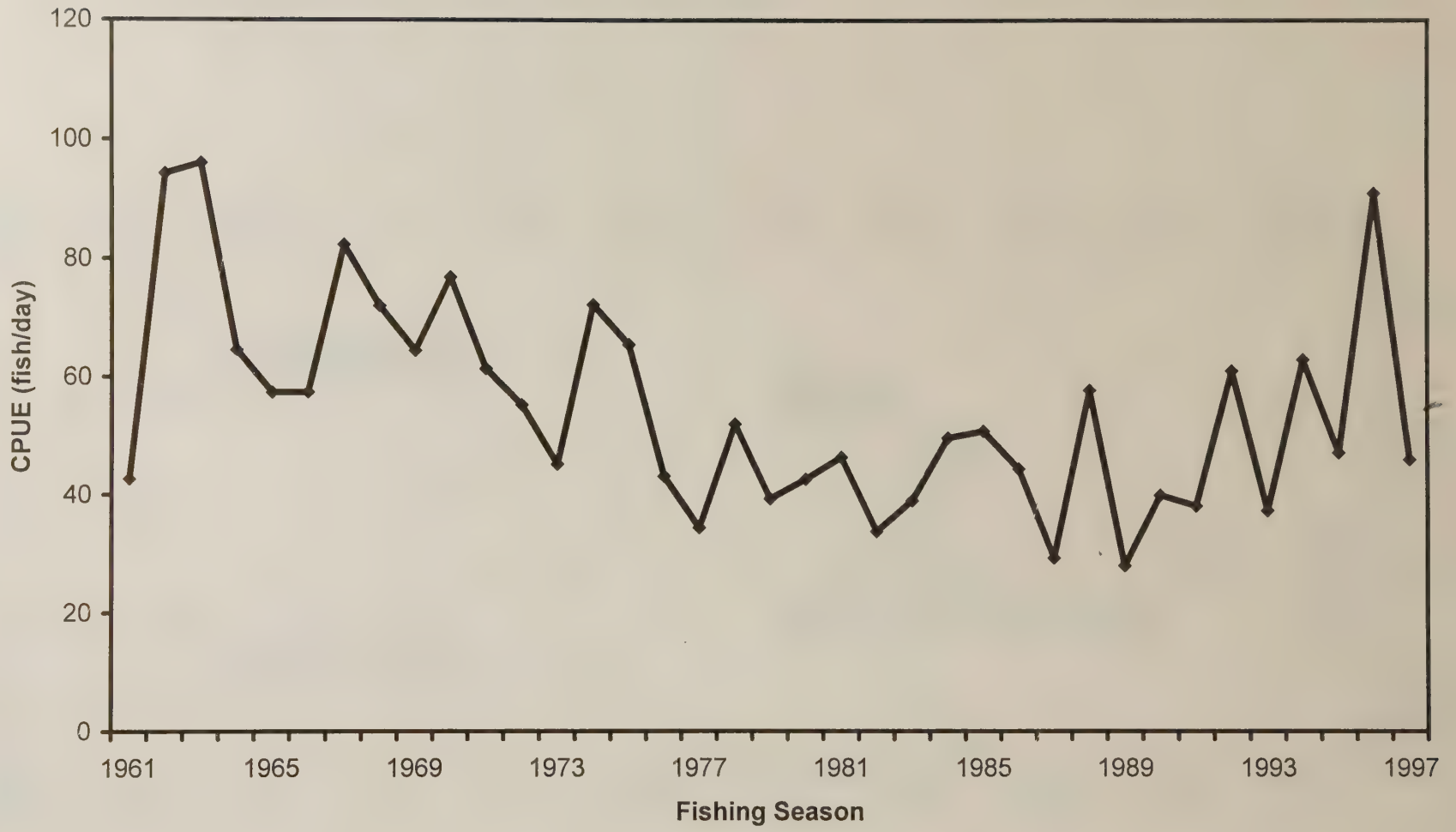


Figure 4. North Pacific Albacore CPUEs by U.S. troll vessels, 1961 through 1997.

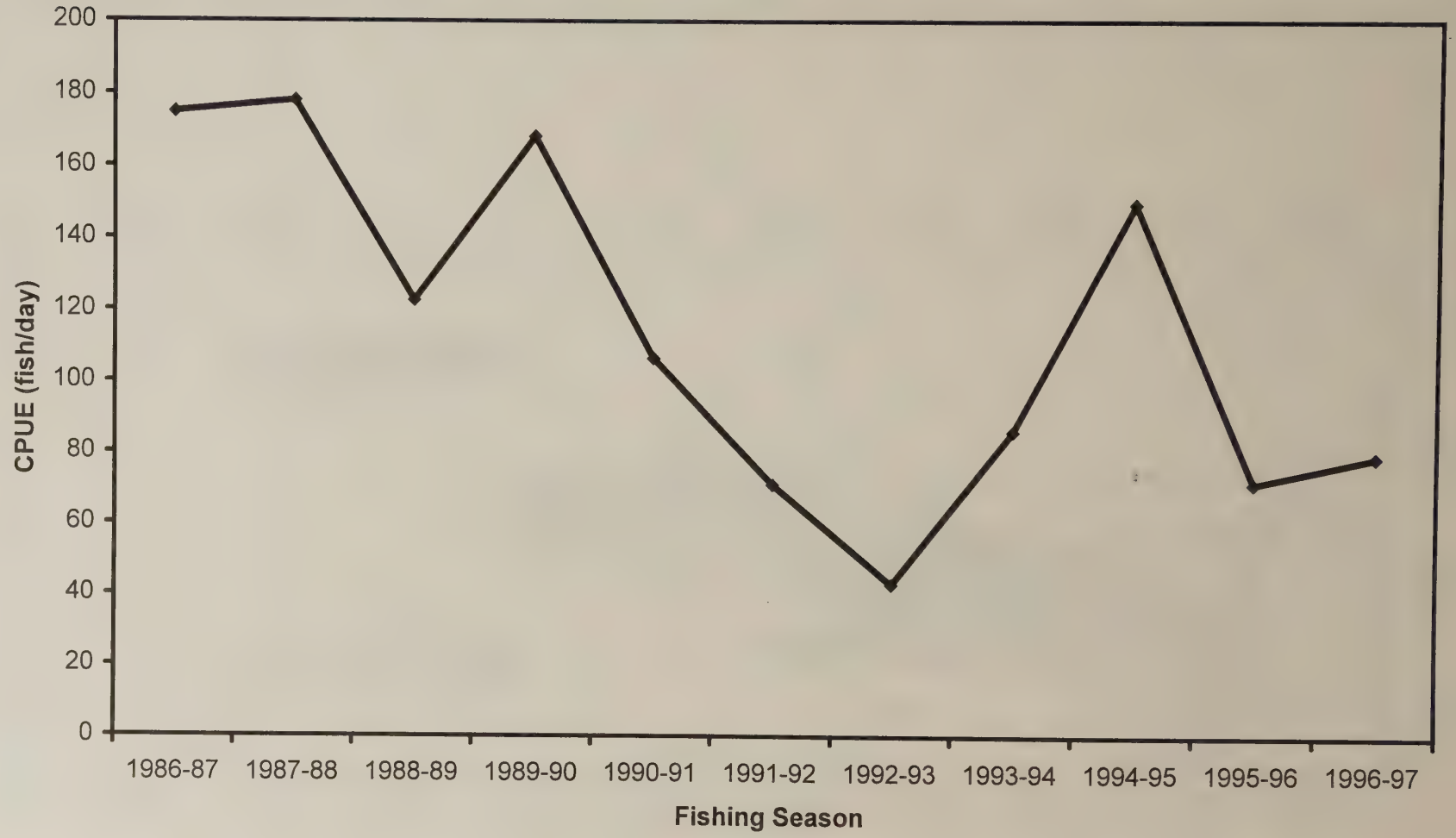


Figure 5. South Pacific Albacore CPUEs by U.S. troll vessels, 1986-87 through 1996-97.

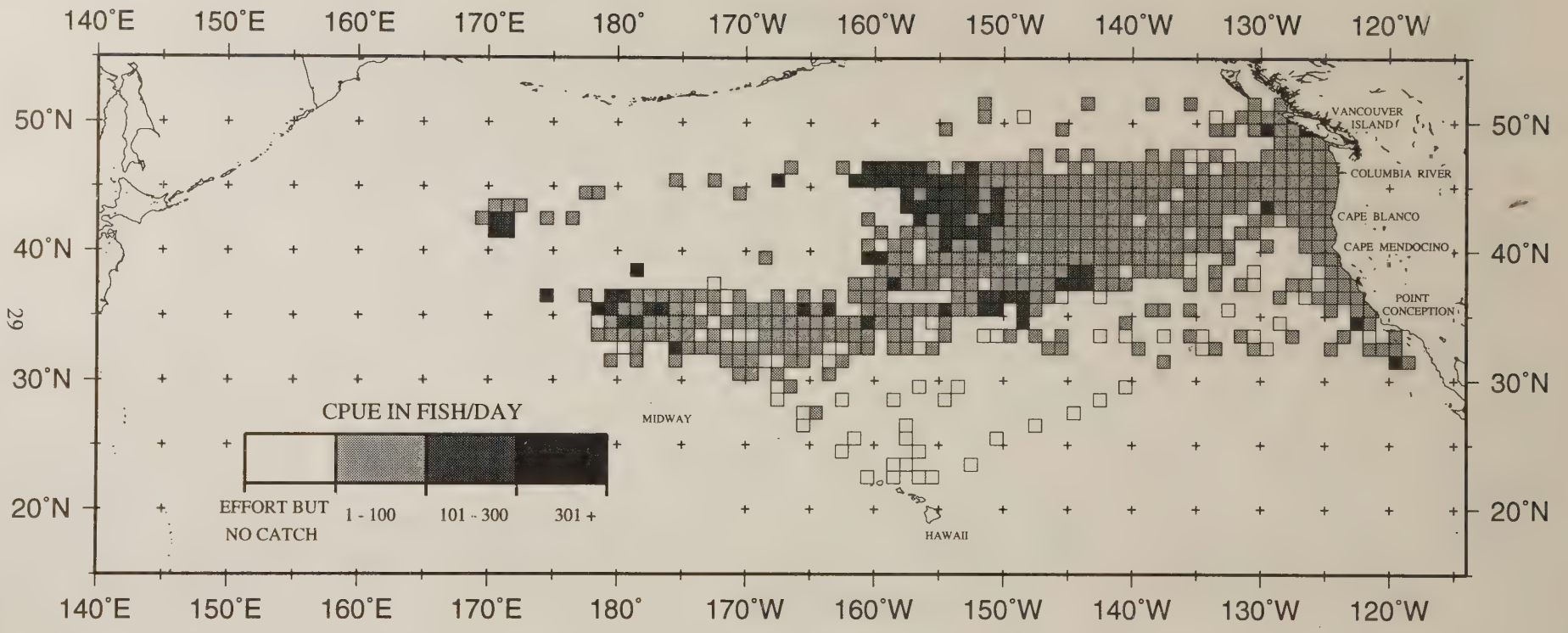


Figure 6a. Albacore CPUEs by U.S. troll vessels during the 1997 North Pacific season.

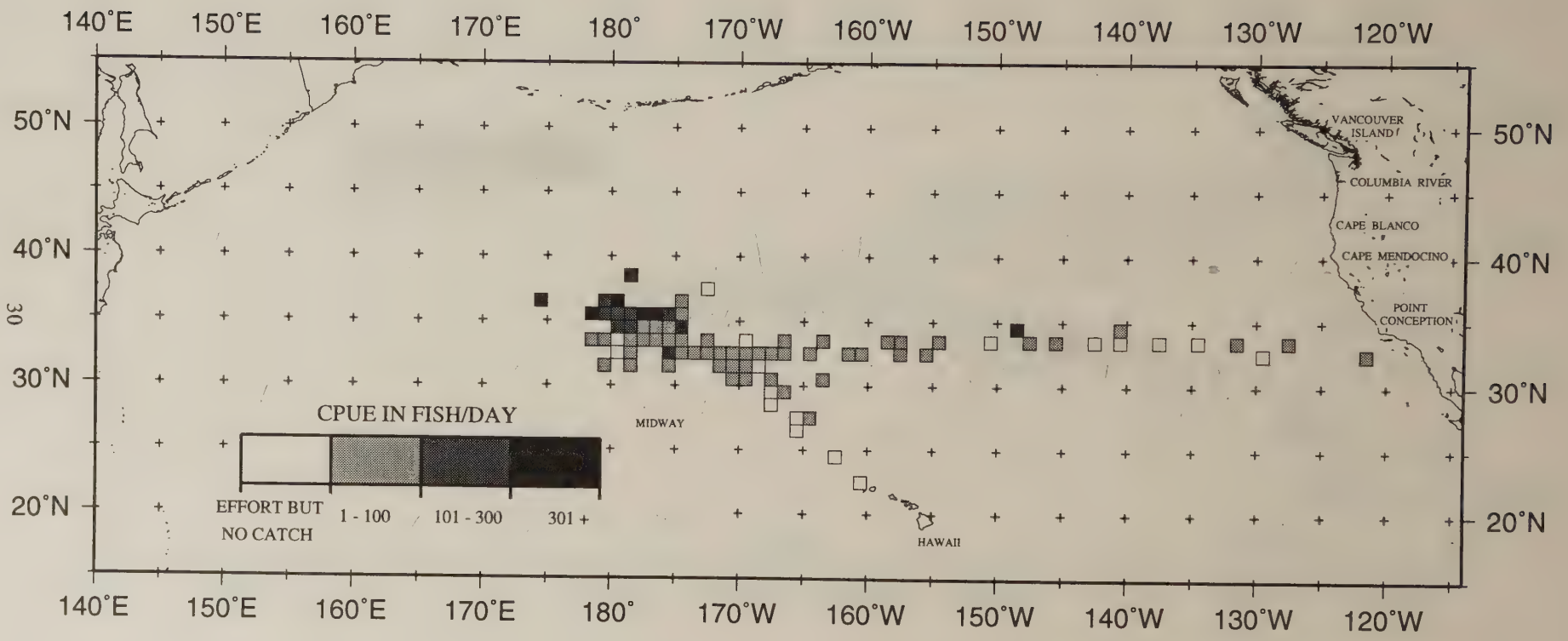


Figure 6b. Albacore CPUEs by U.S. troll vessels in May 1997.

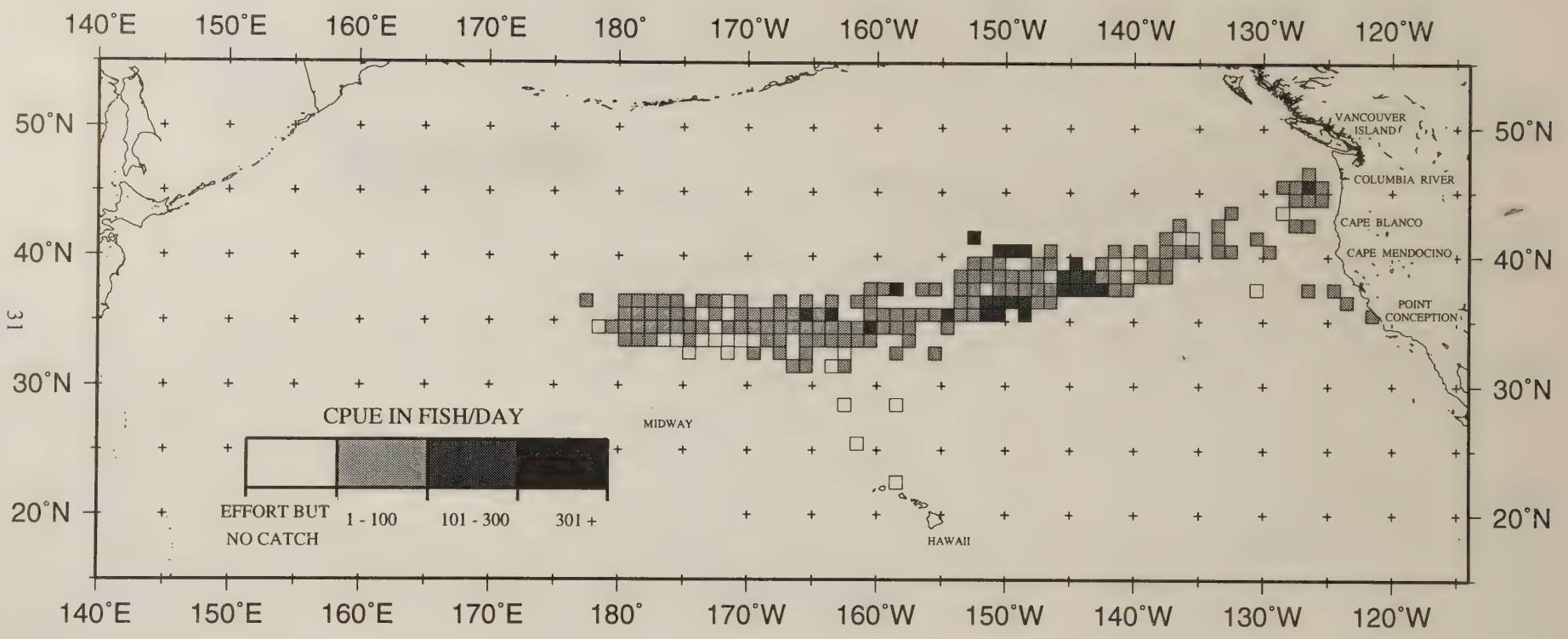


Figure 6c. Albacore CPUEs by U.S. troll vessels in June 1997.

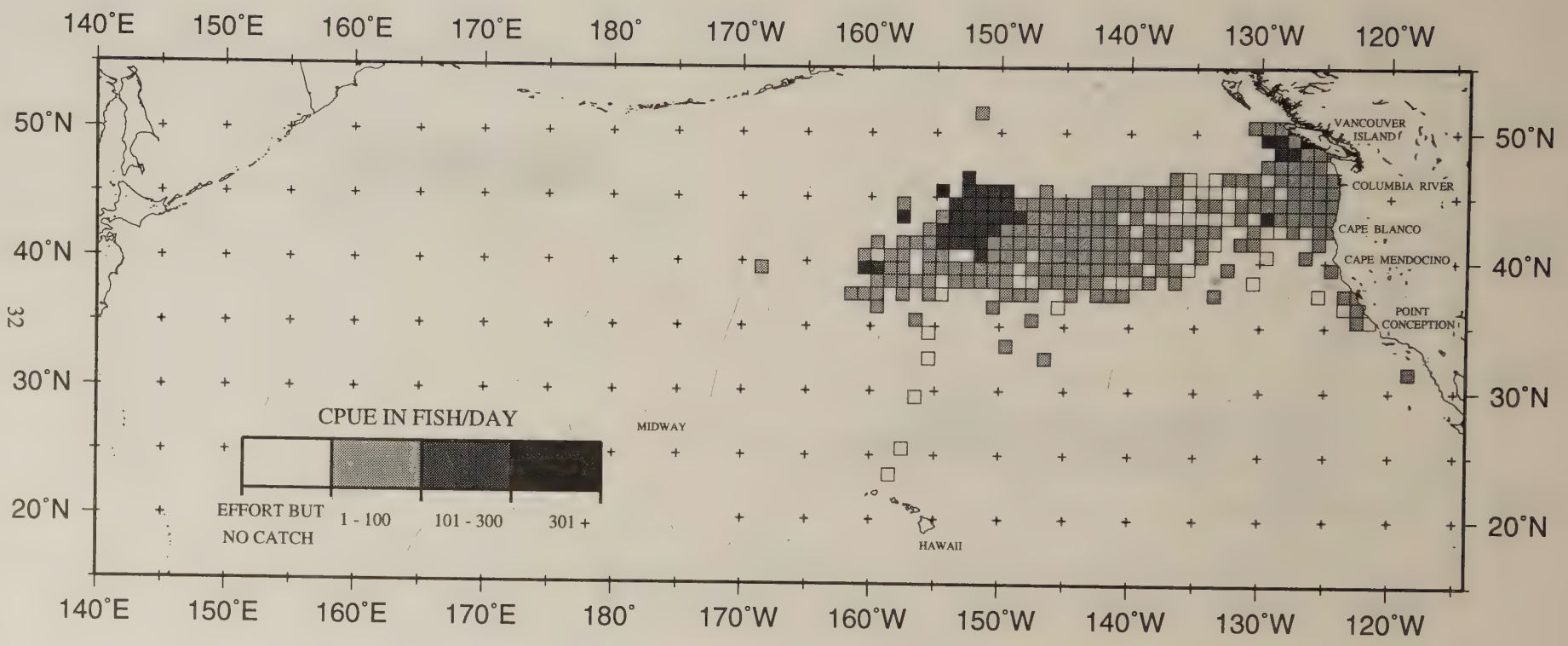


Figure 6d. Albacore CPUEs by U.S. troll vessels in July 1997.

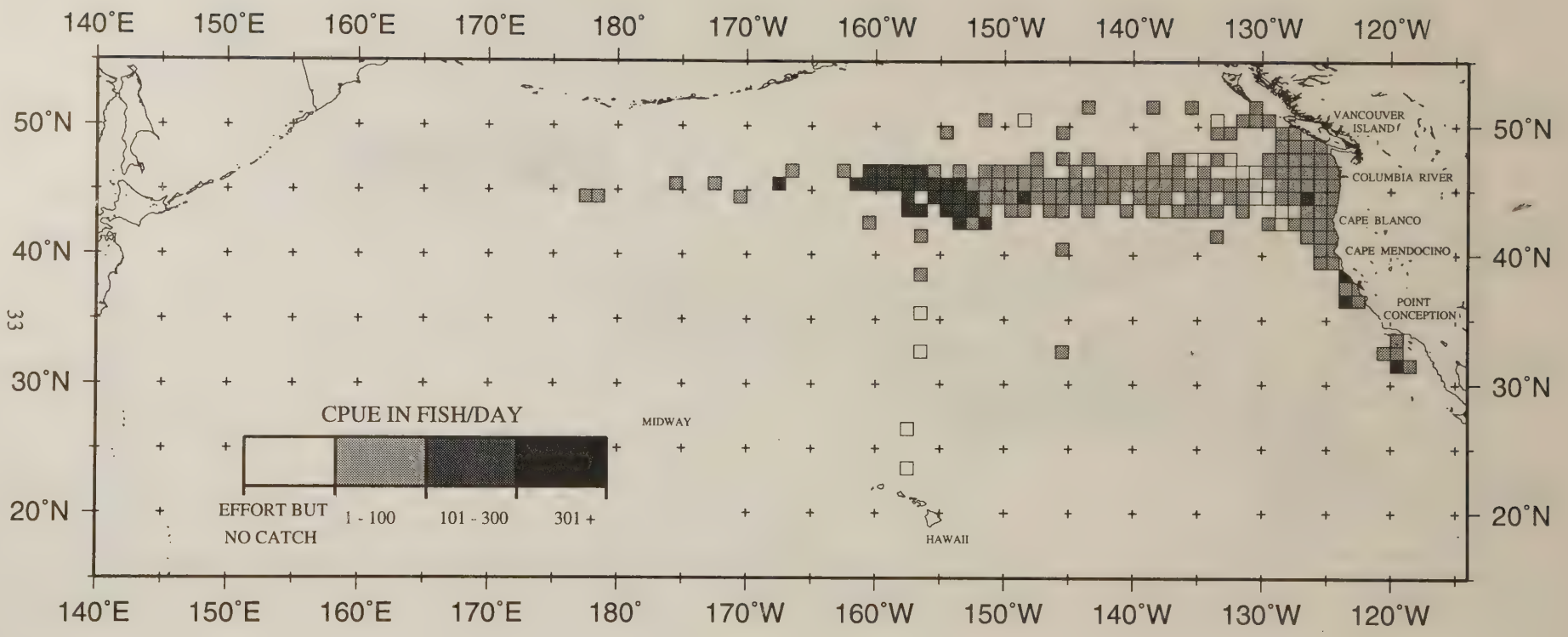


Figure 6e. Albacore CPUEs by U.S. troll vessels in August 1997.

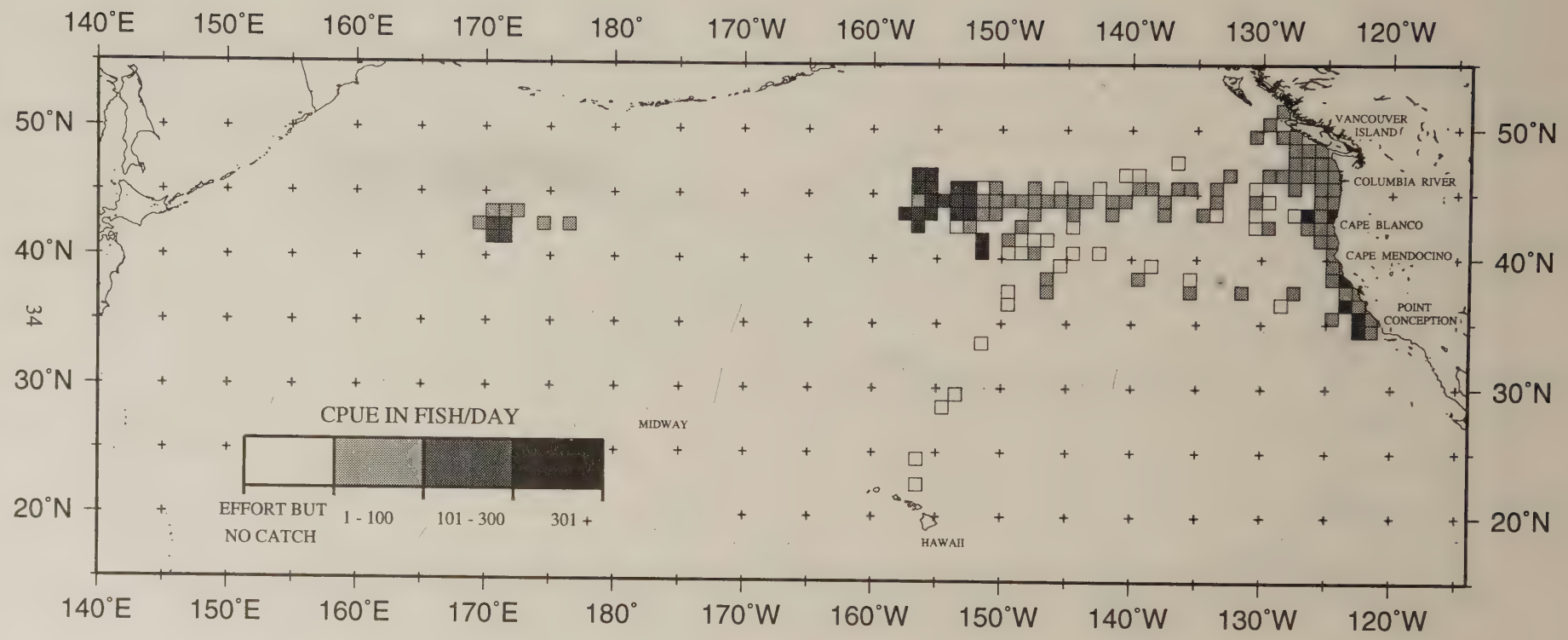


Figure 6f. Albacore CPUEs by U.S. troll vessels in September 1997.

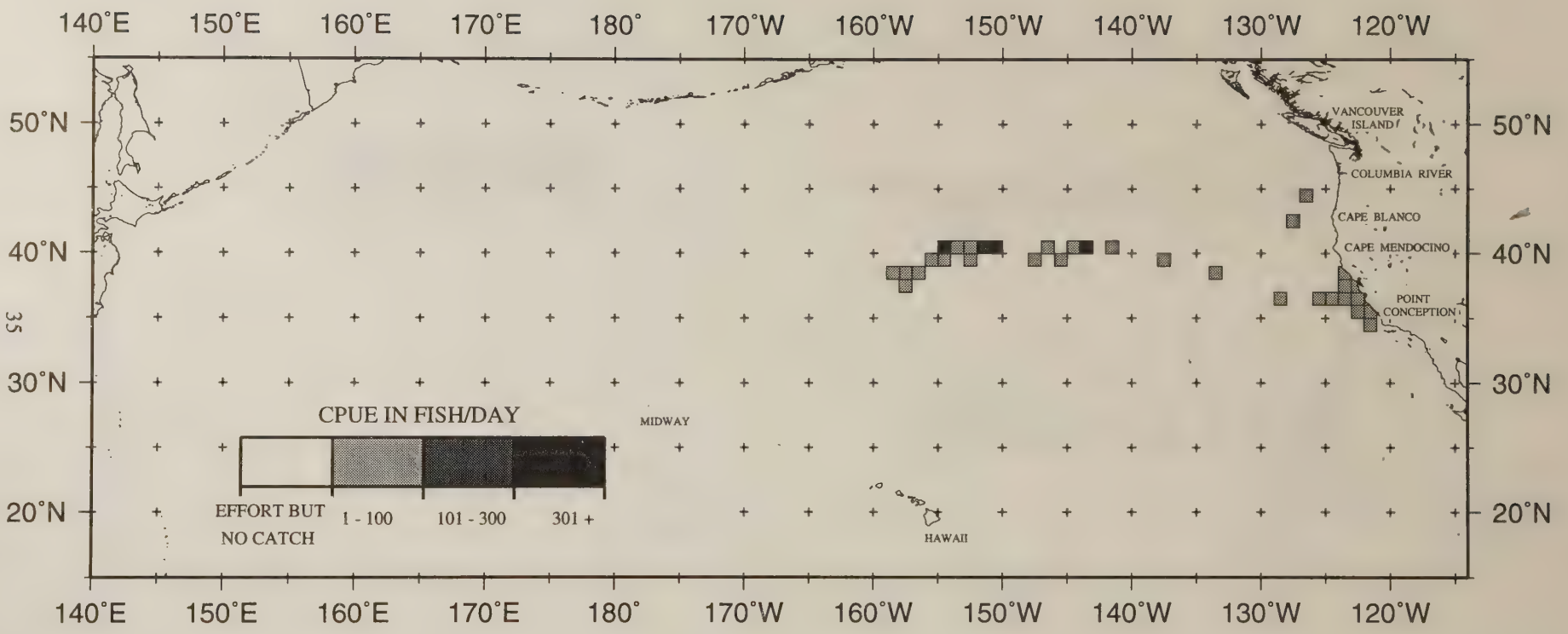


Figure 6g. Albacore CPUEs by U.S. troll vessels in October 1997.

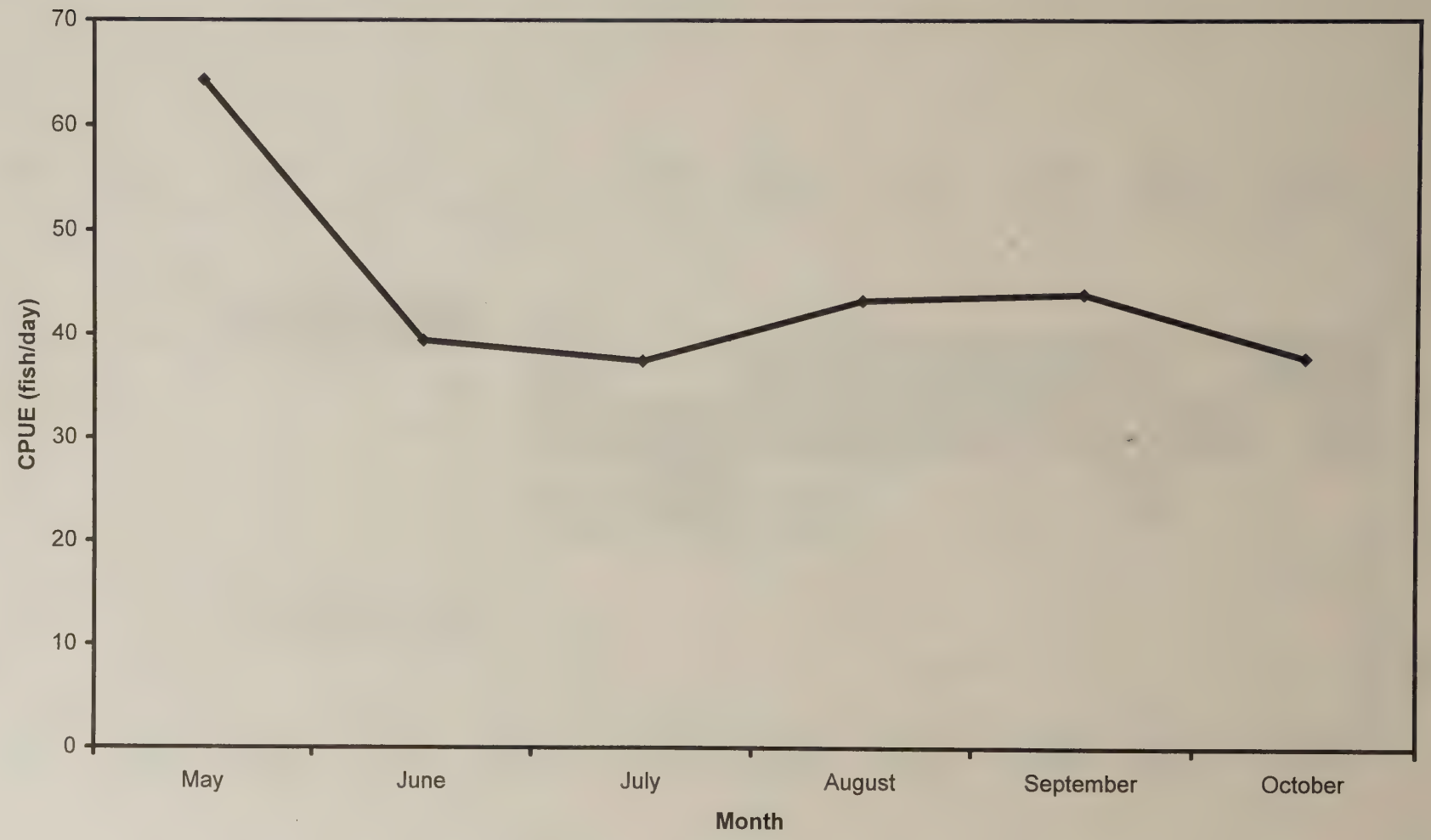


Figure 7. North Pacific Albacore CPUEs by U.S. troll vessels from May 1997 through October 1997.

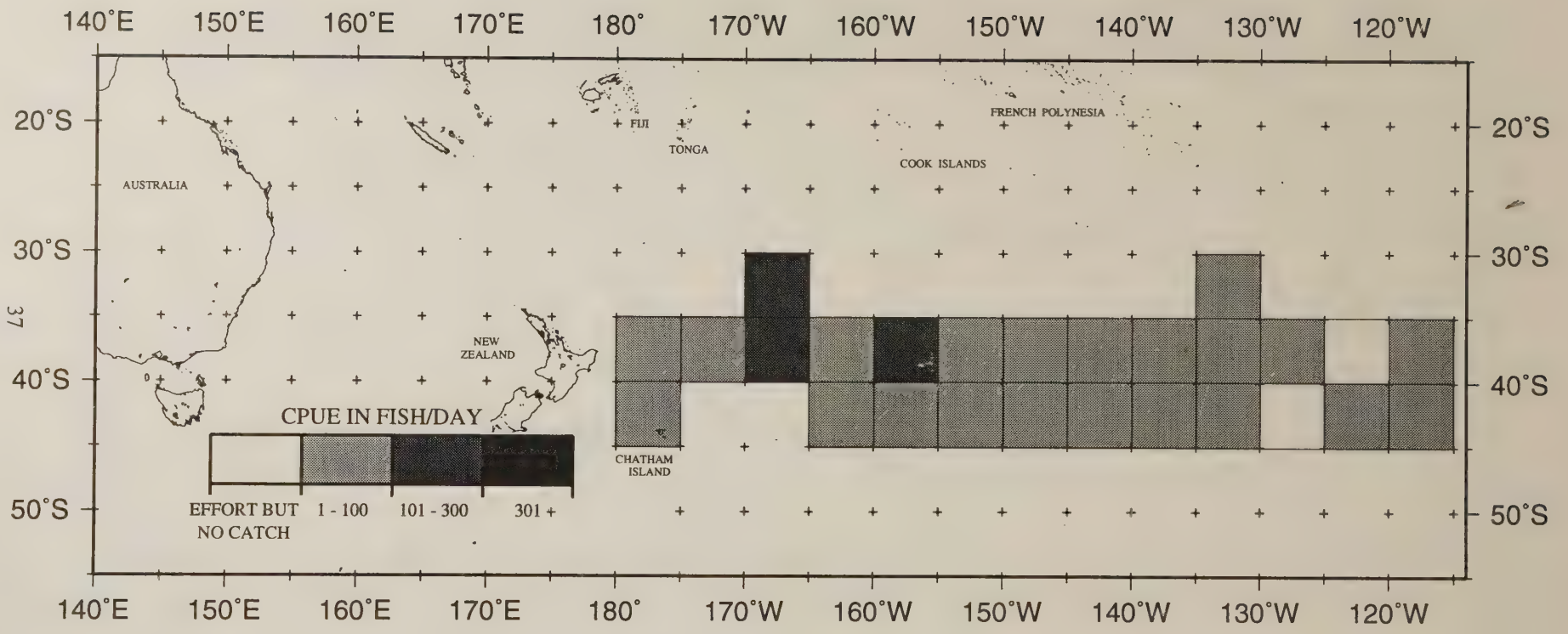


Figure 8a. Albacore CPUEs by U.S. troll vessels during the 1996-97 South Pacific season.

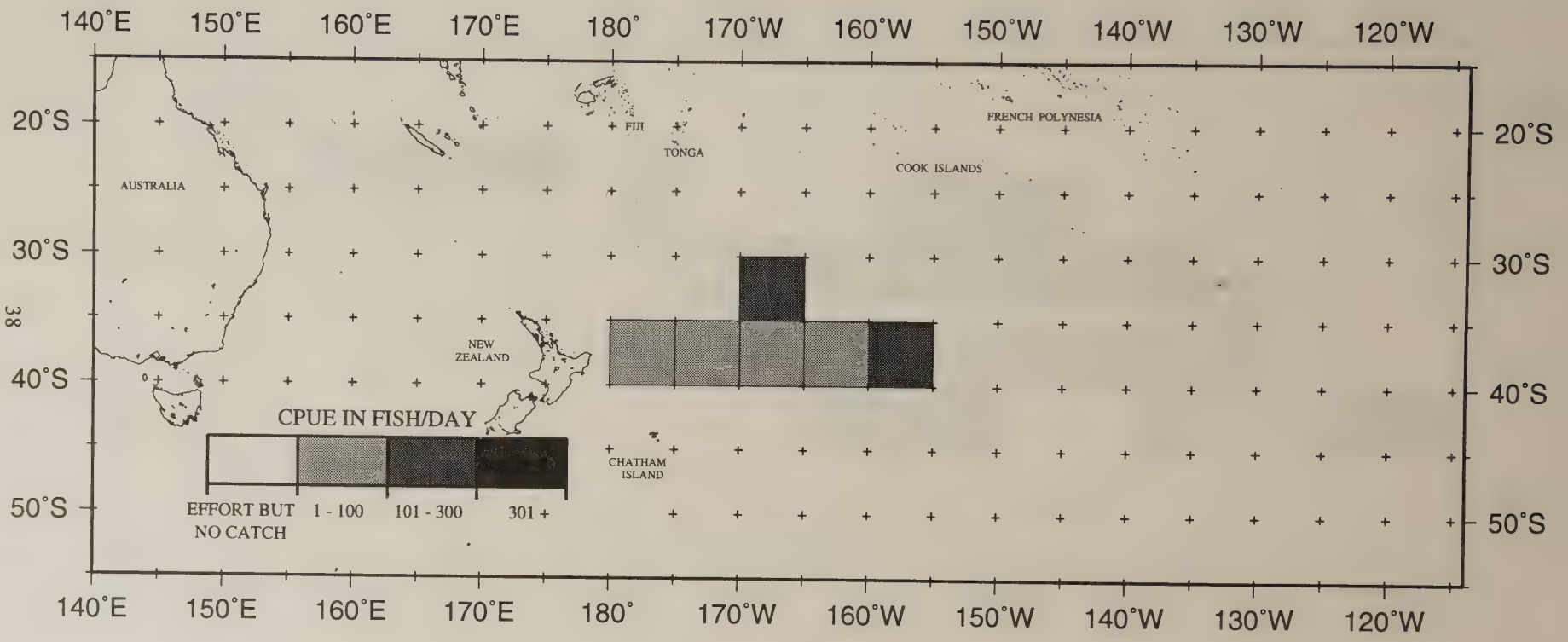


Figure 8b. Albacore CPUEs by U.S. troll vessels in December 1996.

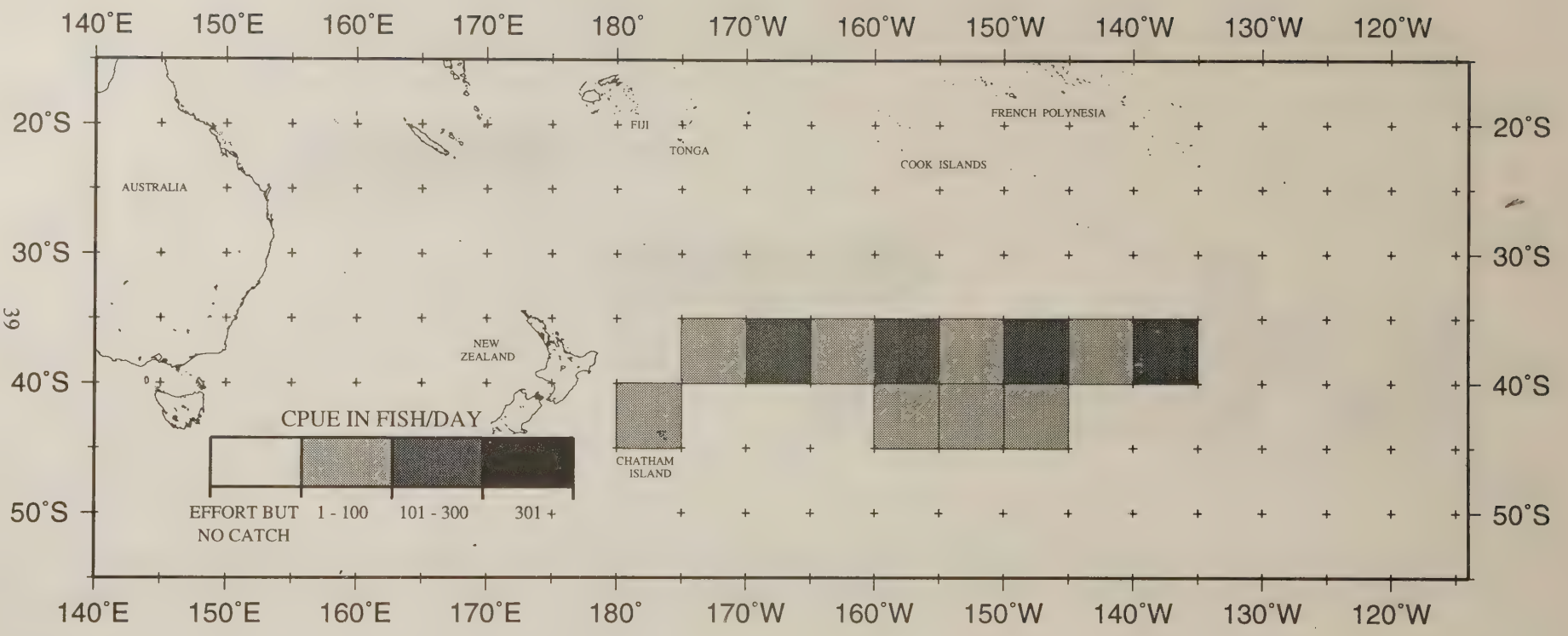


Figure 8c. Albacore CPUEs by U.S. troll vessels in January 1997.

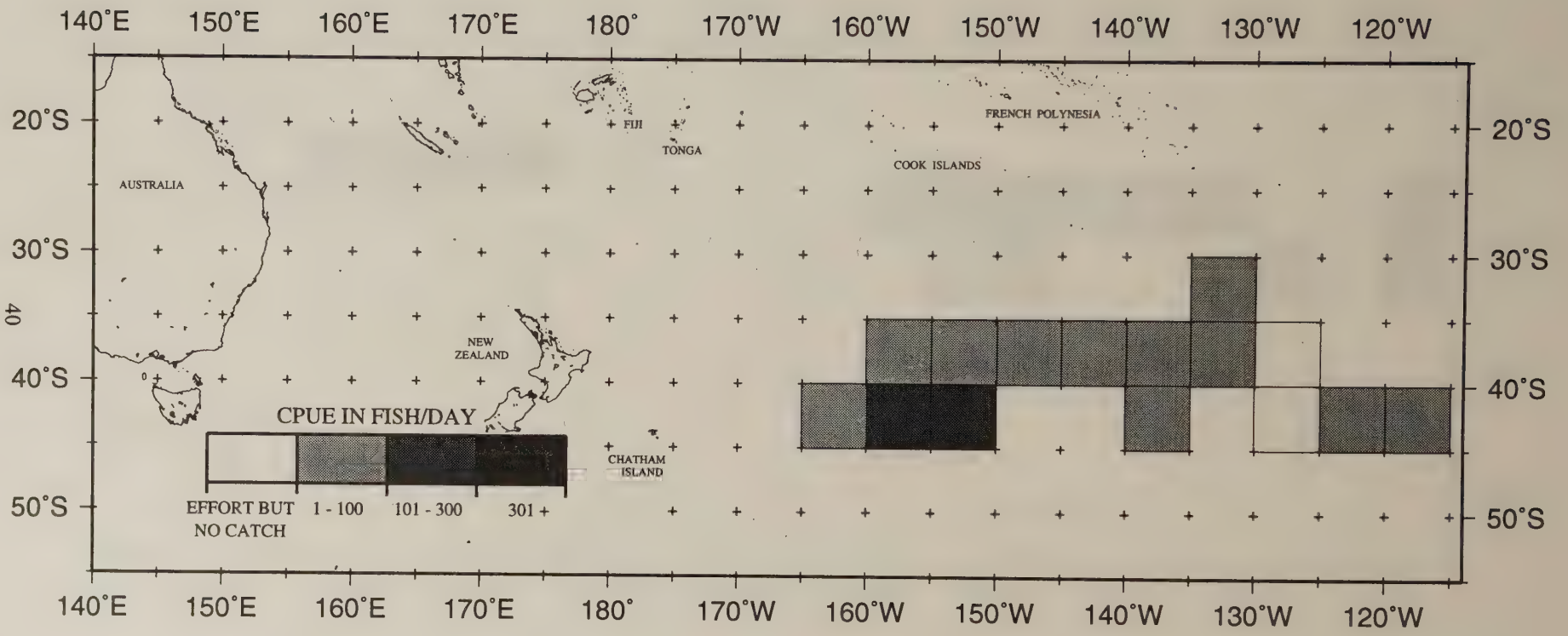


Figure 8d. Albacore CPUEs by U.S. troll vessels in February 1997.

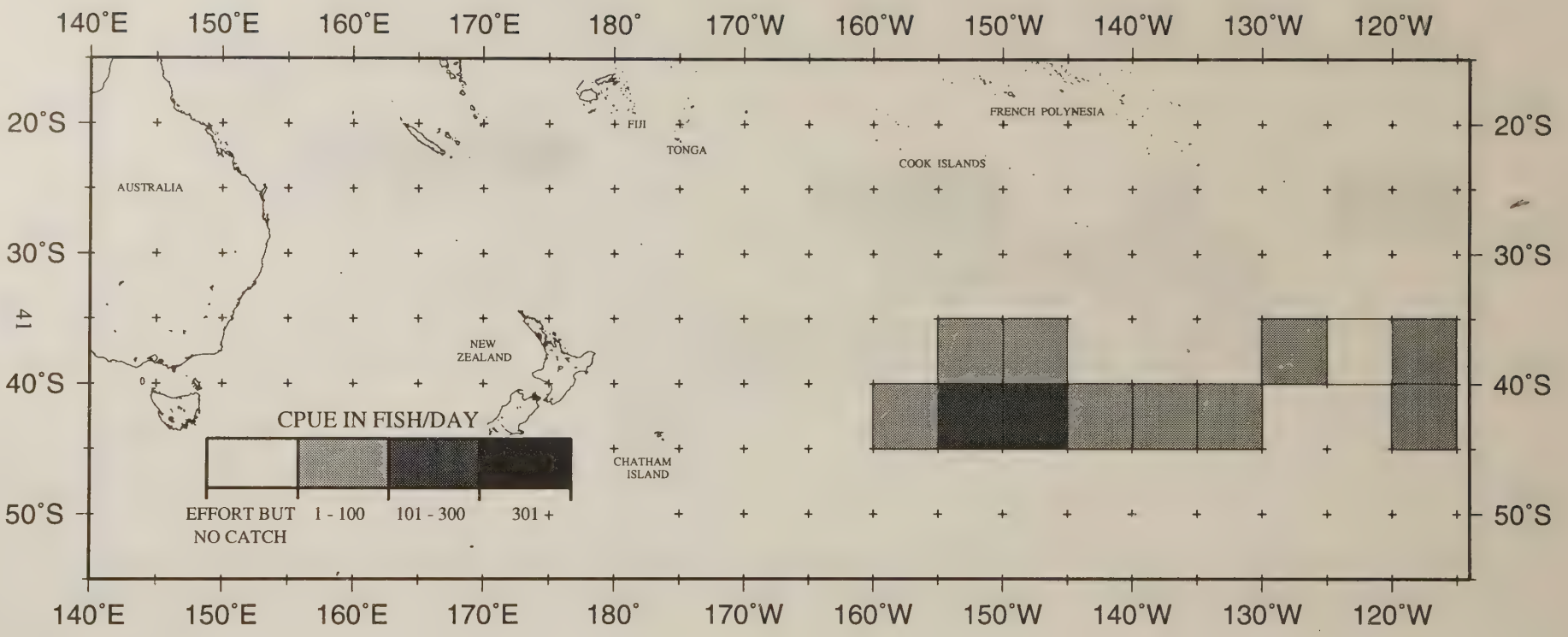


Figure 8e. Albacore CPUEs by U.S. troll vessels in March 1997.

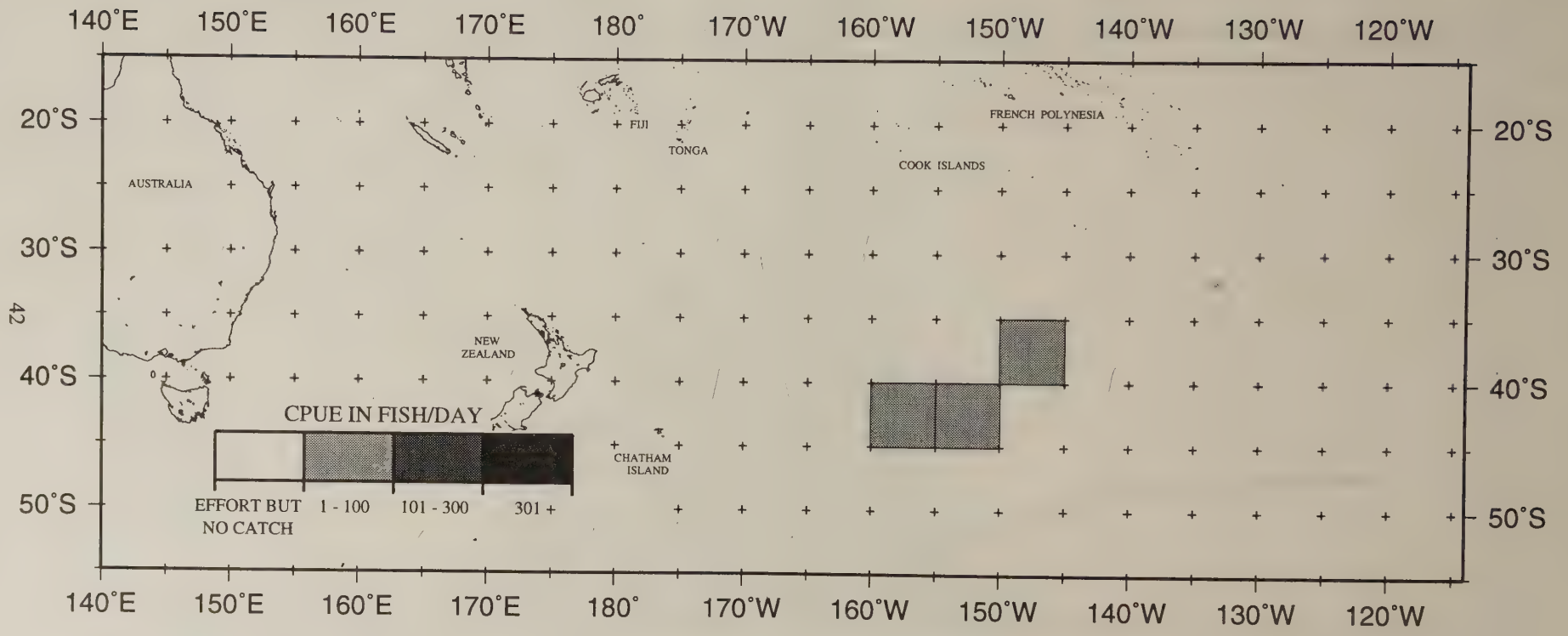


Figure 8f. Albacore CPUEs by U.S. troll vessels in April 1997.

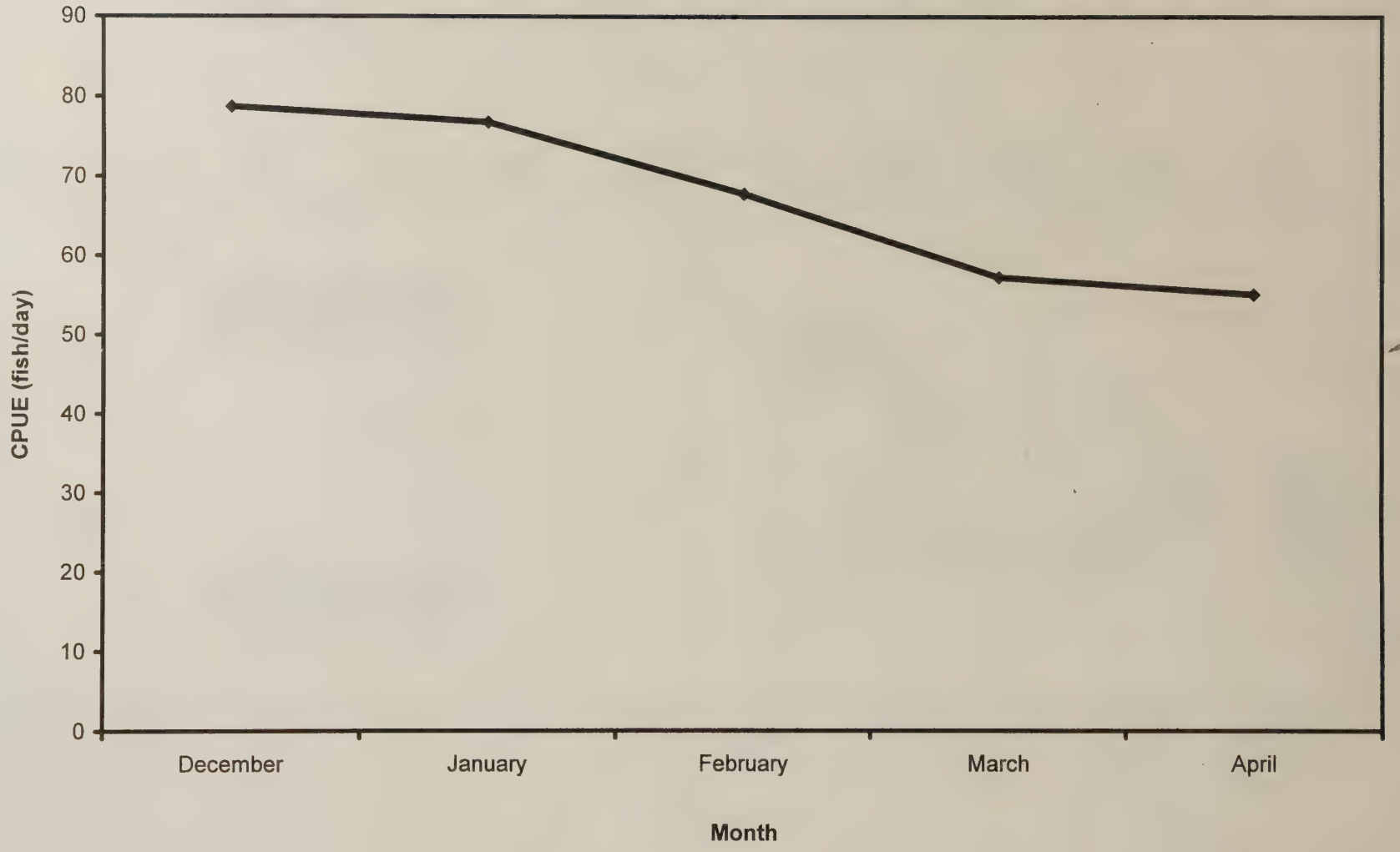


Figure 9. South Pacific Albacore CPUEs by U.S. troll vessels from December 1996 through April 1997.

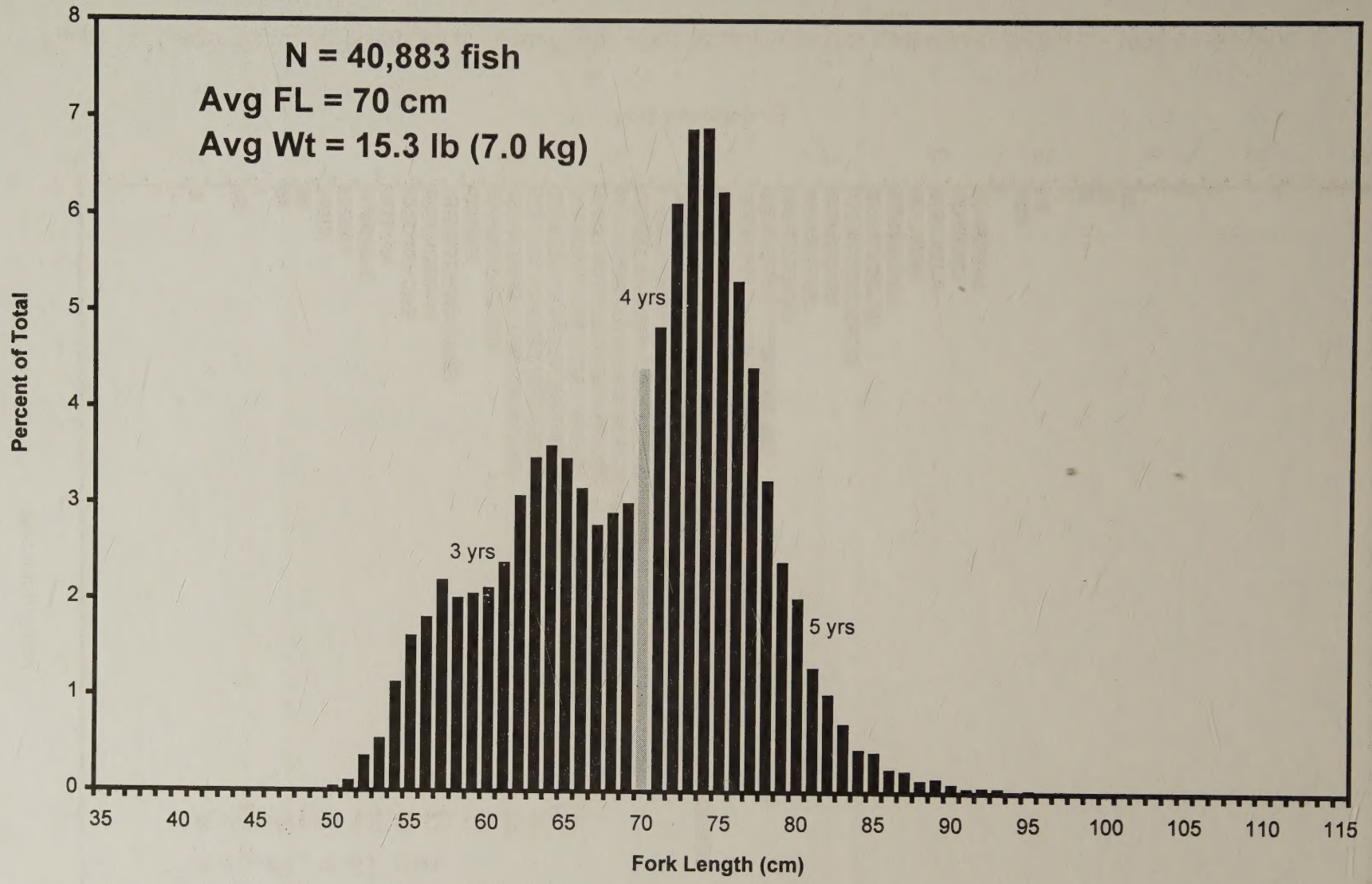


Figure 10. Length-frequency histogram of North Pacific albacore caught by U.S. troll vessels during the 1997 season.

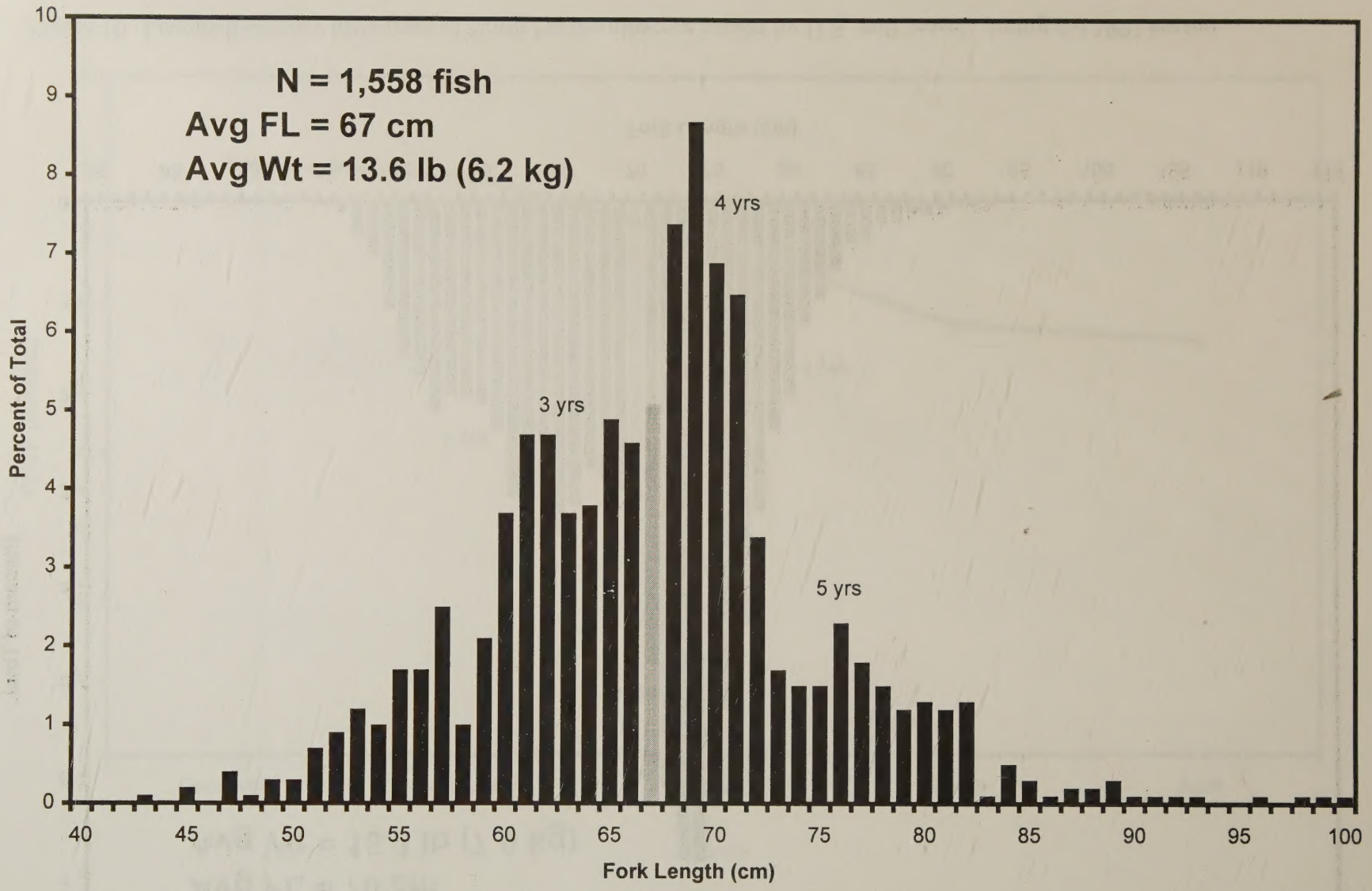


Figure 11. Length-frequency histogram of South Pacific albacore caught by U.S. troll vessels during the 1996-97 season.